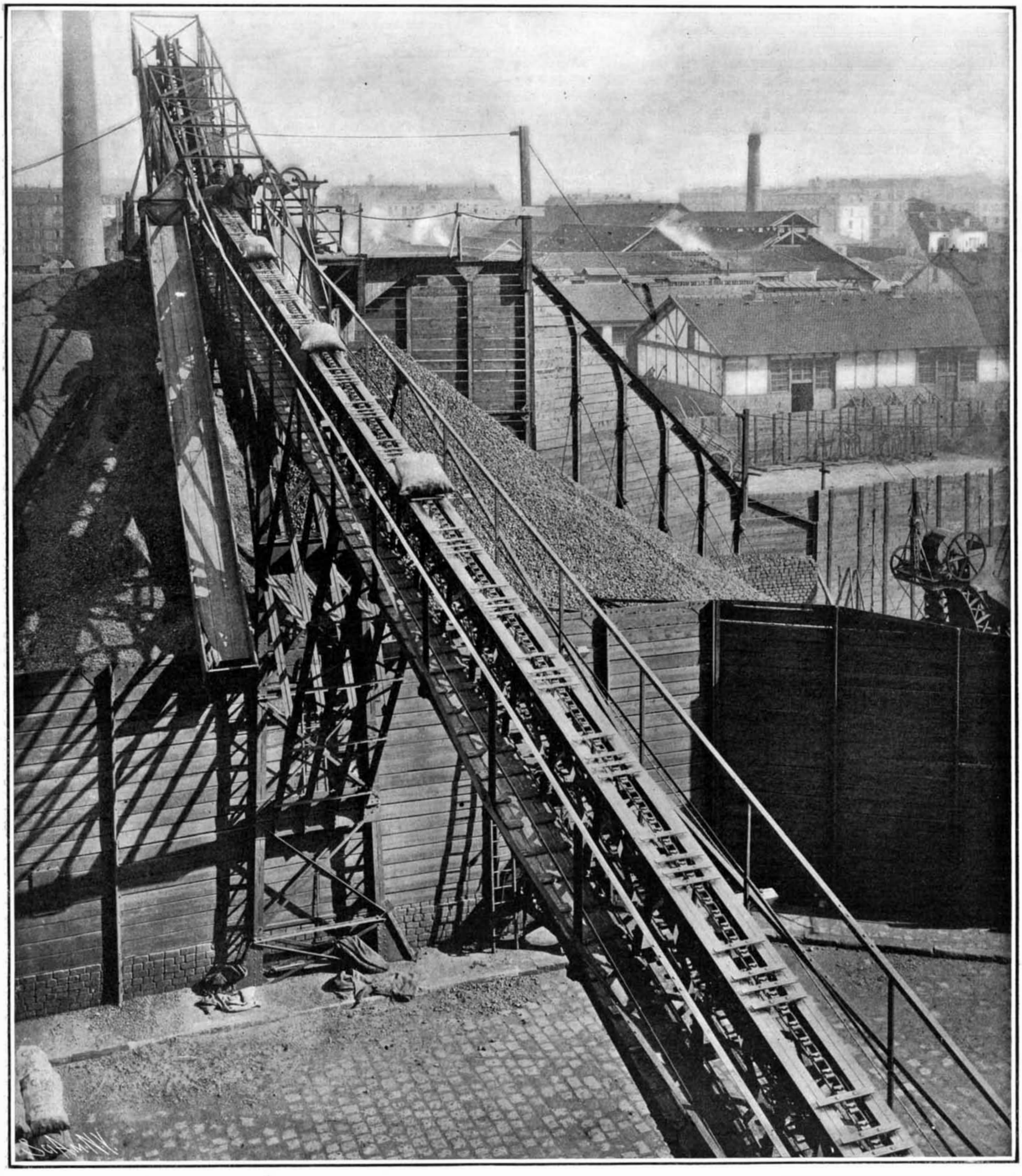
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1905, by Munn & Co.]

Vol. XCIII.—No. 20.
ESTABLISHED 1845.

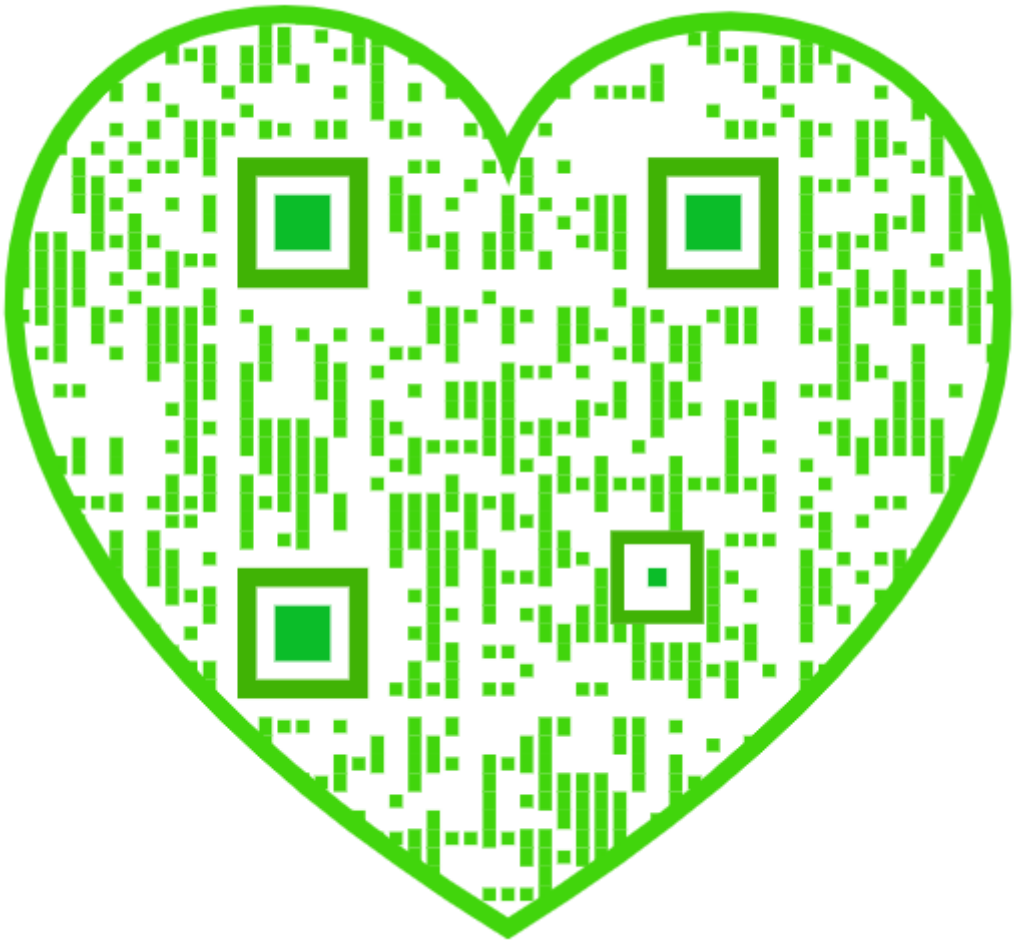
NEW YORK, NOVEMBER 11, 1905.

10 CENTS A COPY.
$3.00 A YEAR.



Conveyor for Bags of Coke, Clichy Gas Works.

A VISIT TO A GREAT GAS WORKS.—[See page 380.]



SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (Established 1878) ..... 3.00 "
The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, NOVEMBER 11, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

AN AMERICAN FLOATING EXPOSITION.

In the year 1901 an officer of the Department of Commerce and Labor suggested that for the furtherance of our export trade it would be an excellent idea to equip a large steamer as a floating exposition of American products, and dispatch it on a tour of the principal ports of the world. At its first mention the idea is a decidedly attractive one, and it receives no small measure of indorsement in the fact that it has already been successfully tried by Great Britain and, we believe, by Germany also; while we understand that as part of the comprehensive scheme for the extension of her foreign trade, which Japan has now under serious consideration, that country has planned the fitting out of a similar vessel. We are pleased to note that a strong company which has been formed in New York has advised the Department of Commerce and Labor that they have decided to adopt the suggestion originally made in the Geographic Magazine in 1901. It is proposed to equip a steamer of about 8,000 tons for the special purpose of the expedition, and fit up the various decks with exposition booths of much the same character as those to be seen in any of our great industrial exhibitions, with the one important exception, however, that only exhibits of a thoroughly serious character will be accepted, all exhibits of a trivial or purely speculative and doubtful character being refused. The steamer, in addition to devoting three decks to exhibits, will have living accommodations for about 200 representatives of exhibitors. A route has been laid out which will include a visit to practically every port of importance in the world, and will involve a journey of about 60,000 miles, the trip around the world being made in about fifteen months' time.

The plan is to allow each person who subscribes for forty square feet of space or more, to display his goods and send on the steamer a representative, whose duty it will be to see that the exhibit is properly arranged at each port, to meet the merchants and dealers invited to inspect the exhibits, explain the utility and advantages of the goods, quote prices delivered in the country of consumption, and ascertain what the markets of the country demand, the conditions of competition, and everything affecting the extension of our export trade in each particular locality. The representative will also appoint local agents at the various ports of call. In connection with the visit of the floating exhibition, extensive missionary work will be carried on at each port of call previous to its arrival. By means of circulars printed in the various languages, to be distributed hundreds of miles back in the interior, it is hoped to arouse widespread interest, and nothing will be left undone that judicious newspaper discussion and legitimate advertising can accomplish to prepare the ground for the work of the expedition. The expense of the trip is to be borne entirely by the sale of space on the vessel, of which about 20,000 square feet will be available. Attention is called to the fact that the enterprise is not designed with a view to any profitable return in money to the promoters, but is intended to be a dignified, broad-minded plan to further the cause of America's export trade.

We consider that this ambitious scheme is one of that class whose work is creative, and whose success depends almost entirely upon the thoroughness with which its well-laid plans are followed out. If none but the very best of American products are carried; if the greatest care is exercised to select competent representatives, who should be possessed of at least a fair knowledge of the language of the principal countries to be visited, and if the preliminary missionary work is judiciously and comprehensively carried out, this exposition should prove to be a most powerful factor in the extension of our export trade.

SANITATION OF THE PANAMA CANAL ZONE.

That the two prevailing diseases that render life unhealthy at the Isthmus of Panama can be successfully controlled by the use of simple precautions and remedies, is the opinion of Col. W. C. Gorgas, U. S. A., who is the Chief Sanitary Officer of the Isthmian Canal zone. In a brief but comprehensive and lucid article, to be found in the last annual report of the Smithsonian Institution, this officer describes the sanitary conditions at the Isthmus, and shows the cause and cure of the two great scourges of that country, yellow fever and malaria.

Briefly stated, the sanitary problem is to protect the fifteen thousand men that are likely, before many months, to be employed on the canal, from these two diseases. Yellow fever is conveyed from man to man only by the female Stegomyia, who has previously bitten some human being suffering from yellow fever. Therefore, yellow fever cannot originate in a place where there are no infected Stegomyia, until a yellow fever patient has been introduced and has infected the local pest; or until the mosquito, infected at some distant point, has been introduced. Practically, the introduction of a yellow fever patient is the only method by which the locality can be infected.

At present yellow fever is endemic nowhere on the Canal Zone except in the city of Panama, and the immediate object of the sanitary measures is to get rid of the infected Stegomyia at present in the city. This can be accomplished with great certainty by establishing a system whereby the health authorities are certain to be informed of every case of yellow fever, and then fumigating the house in which this case occurred, so as to destroy all the mosquitoes within its borders. The same thing must be done with all contiguous houses. It has been found by experience that this kills all the infected mosquitoes at that particular focus. By doing the same thing at every other focus as yellow fever occurs, all the foci in the community are gradually destroyed, and when the last focus has been got rid of, yellow fever is at an end. A more expeditious method is to systematically fumigate every house in the town.

The Stegomyia is a house mosquito, and being cleanly in her habits seeks principally the clean rain-water barrels and water containers, and never travels far from her birthplace. Therefore, as an additional sanitary safeguard, every receptacle for water should be so screened that mosquitoes cannot have access to it. The safest precaution is to pipe the water supply in from a distance, so that the people will not need to keep a supply of water in vessels. As a further preventive of standing water, yards must be thoroughly cleaned, sewers must be put in, so as to discourage the throwing of waste water into the yards, streets should be paved and swept, and garbage collected so as to decrease to the minimum all trash that is capable, in any way, of retaining fresh water. These precautions are exactly those which the government carried out at Havana, with results so flattering that yellow fever has been wiped out of that once famous, or rather infamous, center of the scourge. When Panama has thus been freed from yellow fever, as it most certainly will be, no more cases can occur until a yellow fever patient is introduced from some infected point without. This will be absolutely prevented by a proper system of quarantine.

An even more important problem than that presented by yellow fever is the control of malaria throughout the Canal Zone. The ten thousand natives of the district are distributed in about twenty small villages along the route of the canal, and these people are very generally affected with malaria. A recent microscopic examination of the blood of these people, taken at random at various points along the line, shows that out of several hundred cases, fifty per cent contained mosquito parasites in the blood. Four times out of five, if the female Anopheles bites a native she becomes infected, and when she bites one of our nearby laborers, he in turn becomes infected. Hence, if our laboring force is not to be completely used up, as was that of the French government, preventive sanitary measures must be taken.

There are two ways of approaching this problem; either by doing away with the infected human being, or by doing away with the mosquito. Since it is out of the question to do away with the infected natives, the remedy must be sought in the extinction of the mosquito. If some substance could be introduced into the circulation of the infected man and kill the parasite, and at the same time not be injurious to the man, the desired object would be effected, and in quinine has been discovered the suitable poison. This vegetable substance is harmless to man and fatal to the malarial parasite. Most of the effective tropical sanitarians, the Germans and the Italians conspicuously, have achieved a great success by inducing as large a proportion of the population as possible to take regularly small quantities of quinine, and they have succeeded, without adopting any other measures, in doing away with malaria in the several localities.

The disease may also be successfully attacked from the side of the mosquito, and the Anopheles may be as effectively exterminated as the Stegomyia by covering up water containers, clearing up the yards, preserving the surface of the road so there will be no puddles, instituting a regular system in all towns for the collection of garbage, and by the use of oil. Since the malaria problem along the route of the Panama Canal is, because of local conditions, more serious than in any place where the above-mentioned methods have been tried, the government intends to make sure the work of extermination by applying both systems, and it is confidently expected that, by the time the work is in full swing, our laborers will be completely protected from the two great tropical diseases.

COLLOIDS, SUSPENSIONS, AND RELATED PHENOMENA.

Van't Hoff's "Laws of Chemical Equilibrium in Rarefied Gases and Solutions," published some twenty years ago in the transactions of the Swedish Academy, might have escaped general attention had they not found an advocate in Ostwald. In this famous essay it is shown that dissolved substances behave like gases, but the argument is not easy to follow even now, when the facts have become familiar. It will be recalled, also, that Van't Hoff's laws, apparently, did not apply to acids, alkalies, and salts, that is to say, to the substances called electrolytes, which, when dissolved, conduct the electric current and are decomposed by it. These apparent exceptions, however, were soon explained and the great riddle of solution answered by Arrhenius. Recent work in theoretical chemistry has been largely devoted to the development of the Van't Hoff-Arrhenius theory, which is now firmly established.

We know more than a hundred thousand definite organic or carbon compounds, and a great many inorganic ones, all of which have fixed melting or boiling points. Many of them are also characterized by definite crystalline form. Very few of these definite and sharply-characterized compounds are found in living organisms and consequently they contribute little to the comprehension of vital processes.

Most of the substances which occur in animal and vegetable organisms do not crystallize or possess fixed melting and boiling points, and Van't Hoff's theory does not apply to them. A solution of albumen, for example, exerts an osmotic pressure so small that the mass of the albumen molecule computed from this pressure by the formula used for crystallizable compounds is too large (15,000) to be generally accepted. There is no reason why the albumen molecule should not be very large, but it seems wrong in principle to apply the usual formula for calculating molecular weight to such a substance, which does not form a solution in the ordinary sense of the word.

There are, also, inorganic bodies which have very large molecules, if we may judge from their inability to pass through porous membranes. If a solution of salt or sugar is put into a bag of parchment paper or a sausage skin free from grease, and suspended in a vessel of water, the salt or sugar gradually diffuses through the envelope, but many apparently dissolved substances, including silica as well as albumen and gelatine, do not diffuse under these conditions. These facts were discovered in 1830 by Graham, who gave the name crystalloids to the diffusible substances, most of which crystallize, and the name colloids to the non-diffusible substances, most of which do not crystallize. Van't Hoff's theory of solution applies to crystalloids, but not to colloids. The study of colloids, which may fairly be called the foundation of knowledge of the vital process, has been reserved for the twentieth century, and great progress has already been made.

Silica, alumina, ferric and zinc oxides, arsenic and antimony sulphides, are some of the many inorganic colloids. Of especial interest, partly for practical reasons, are the colloidal metals. Within the last ten years silver, gold, platinum, bismuth, and other metals have been brought into "colloidal" solution by various methods. In Carey Lea's process, solutions of metallic salts are decomposed under special conditions; in Bredig's the metal is pulverized by the electric arc under water; in Paal and Mueller's the metal is held in suspension by dissolved substances. Under the most powerful microscope the dark brown, red, and green liquids thus produced appear as homogeneous solutions, the metallic particles being invisible, but the ultramicroscope of Siedentopf and Zsigmondy, which distinguishes objects as small as four millionths of a millimeter (1-6,000,000 inch) in breadth, resolves these and other inorganic colloidal solutions into separate particles and thus confirms Graham's view of their nature.

In principle, indeed, every solution, even of a salt, is a suspension. De Bruyn and Von Calcar have crystallized salt from solution by centrifugal separation, and De Bruyn and Wolff have shown that solutions of sugar, like turbid liquids, disperse and polarize light.

True suspensions, formed by filtering the coarser particles from a mixture of starch and water, or by pouring alcoholic solutions of resins into water, behave like inorganic colloids. Both are subject to "cataphoresis," that is, they are moved by an electric cur-

rent. Most of the inorganic colloids move toward the positive electrode, and Biltz has discovered that colloids of opposite polarities precipitate each other.

Like the true suspensions, again, most inorganic colloids are precipitated by salts. Salts of trivalent metals (alum, ferric sulphate) are eight times as effective as salts of bivalent metals (barium chloride, copper sulphate), and fifty times as effective as salts of univalent metals (common salt, potassium iodide). The clarifying property of iron and aluminium salts has long been known and utilized. The Mississippi, Nile, and other rivers carry in suspension immense quantities of solid matter which the salt sea water precipitates at their mouths as bars and deltas. Schloessing suggests that the humus layer of the soil would be quickly washed away by rain but for the decomposition of organic matter with the formation of carbonic acid, which, like other acids, possesses great clarifying or precipitating power.

The gelatine-silver emulsion with which photographic plates are coated is comparatively insensitive until it has been "ripened" by prolonged heating, which agglomerates the very fine particles of silver salt into larger ones. In my opinion the process would be greatly accelerated by the addition of a salt of a bivalent or trivalent metal.

Most organic colloids differ from inorganic colloids and suspensions in remaining unaffected by salts of univalent metals—at least, by the mere traces, often not to be detected chemically, that suffice to precipitate suspensions. Some are not affected even by salts of bivalent metals. Organic colloids also present a different appearance under the ultramicroscope, an albuminous solution showing a mass of connected particles, which separate, diminish, and finally vanish only after fermentation or copious dilution. This agrees with the theory advanced by Quincke, thirty years ago, that organic colloids form a sort of network, like a sponge or a mass of foam, and consist of dilute solutions imprisoned by walls formed of concentrated solutions. Buetschli has extended this theory to protoplasm and applied it to the explanation of vital processes.

Neisser and Friedmann, as well as the writer, have shown that bacteria in suspension behave like organic colloids, being precipitated only by such salts as precipitate albumen and unaffected by common salt, barium chloride, etc. The bacterium was found to have an albuminous envelope which protected it from precipitation, and certain inorganic colloids which behave like organic ones were found to be similarly protected —for example, Paal's "bismuthose."

The albuminous envelope of the bacterium is susceptible of a curious modification. Serum from an animal infected with typhus bacilli precipitates typhus but no other bacilli, and similar laws hold for cholera and dysentery. This phenomenon, known as "agglutination," forms the basis of Vidal's diagnostic test for typhus. Now, Bordet has discovered that this agglutination and precipitation occur only in saline solutions, showing that the effect of the serum has been to make the bacilli more closely resemble inorganic particles in suspension. In a similar way, serum from a rabbit previously inoculated with bovine serum forms a precipitate with bovine, but with no other serum. A similar specific "precipitin" reaction exists for each warm-blooded species, but the precipitation occurs only in saline solutions.

We see, therefore, that the precipitation of colloids and suspensions by salts, a phenomenon whose importance has only lately been appreciated, plays a prominent part in the formation of the earth's surface and the life process of the organic cell.

"THE SCIENTIFIC AMERICAN BOY."

Every typical American boy is pretty much of a "Yankee genius," no matter what part of our great country he hails from. He can always be depended upon to provide his own diversions, even out of the most limited resources. This is an excellent trait, and should be developed to the fullest extent because of its bearing on the future career of the boy. "The Scientific American Boy," by A. Russell Bond, has been written for the purpose of stimulating this resourcefulness in boys. Genius is not a subject that can be taught, but is rather a faculty that must be developed. "The Scientific American Boy" is, therefore, not a book of instruction, but is rather a story of the doings of a club of boys, written in such a manner as to awaken the interest of the readers and induce them to emulate their example. The scene of the narrative is an island on the Delaware River, where the club spends several vacations in camp. Under the leadership of "Bill," who is the "Scientific American Boy," and with the occasional assistance of Bill's Uncle Ed, who takes a great interest in the boys, the club proceeds to develop the resources of the island, providing for their needs out of the materials at hand, and building the greatest variety of useful devices and contrivances for their own amusement and diversion. All the acts of the club are chronicled in detail, complete working drawings being given in every case, so that they can, if desired, be exactly reproduced by any American boy of average intelligence. The subjects covered are quite varied. The boy campers' needs are supplied by directions for making tents, straw huts, log cabins, caves, and the like, and a chapter is devoted to camping outfits. Complete instructions are given for making half a dozen different kinds of skate sails, and a large number of snow shoes and skis, besides sledges, toboggans, ice boats, and scooters. Among the miscellaneous subjects may be mentioned scows, canoes, land yachts, and the like. A number of subjects may be classed under the head of Engineering. These are surveying, bridge building, heliographing, wigwagging, how to build a gravity railroad, a windmill, and a waterwheel. Considerable space is devoted to bridge building, simple directions being given for making six different types of bridges, including a simple cantilever bridge. The latter is illustrated with photographs showing a full-sized cantilever bridge of 12-foot span, which was actually built by four young boys, according to the instructions given. The volume is handsomely bound, and contains 320 pages, well illustrated with 320 drawings and 18 half-tone page plates.

SOME CURIOUS USES OF AMERICAN WOODS.

BY L. LODIAN.

The giant sequoias of California, thousands of years old, have been preserved to this day because of their enormously thick bark. From time to time, in the course of ages, forest fires have swept through the big-tree lands, destroying everything, yet only scorching for a couple of inches' depth or so the almost fireproof bark. The flames having carbonized that much of the bark, could not penetrate farther; for the carbonized portion formed an absolutely fireproof covering for the remainder of the interior bark.

In the felling of the giant redwoods for timber, tons upon tons of the foot-thick bark would accumulate as a result of the cutting up of the giants. It was often found seriously in the way, interfering with the removal of the logs; otherwise, it would have been allowed to remain on the ground until it rotted. So there was nothing to do but burn the unsightly heaps.

But one day many years ago, a shrewd Connecticut Yankee named Atkinson, a woodturner by trade, began to think about this waste a bit, during his prolonged residence in his new home on the Pacific slope. True, the bark was too soft to make wooden nutmegs out of it, but it might do for something else. So he thought and thought; and in the course of time had produced a whole variety of useful articles from the hitherto wasted bark; dubbed it "atkinsos," or vegetable asbestos, and made an honest living for years therefrom. The industry spread; and now redwood-bark articles are—in fact, always have been—common property for anybody to make in the West or East. Almost all Pacific State homes have examples in their rooms of the useful articles made from this bark, of which there are two kinds, soft and hard.

Some of these redwood-bark articles are pin cushions, pen wipers, table mats (for receiving hot plates), flatiron mats (to prevent scorching), bathroom non-absorbent mats, fishing floats, temporary corks, life-buoy filling, "cork" jackets, cold-storage insulation, house sheathing, heat insulation (will burn under great heat if attacked both sides, but is about six times a more efficient heat-insulator than woven asbestos). Also coin mats, moisture-proof match safes, bicycle handles, silk-hat brushes, chair-seat mats, sound-deadening insulation, mattress fillings, cork-carpet substitute, and a variety of other uses.

The bark is entirely odorless, of a rich brown color, and is singularly non-absorbent. A piece kept under water for a month will absorb no more moisture than a piece of cork. It has a short, brittle fiber—cork has no fiber whatever—and is consequently not so liable to brittly snap as is the *Quercus suber*. It lacks, however, the elasticity and local toughness of cork, and is slightly heavier in its specific gravity, but is much more easily worked in manufacturing into articles.

Curious Natural Brushes.—These are produced from one of the palmetto species on our southern coasts. The "bristles" of the brush and the solid wood portion thereof are all one. No "coming out" complaint with those bristles!

The brushes are made in two ways. The extreme root of the tree is a mass of fibers. These are cut off close up to the trunk, which is sawn off about an inch up, and the slab is cut up into simple brushes for the bath, toilet, hair, etc. Another couple of inches will be sawn off the trunk, well soaked, and the pithy wood jagged out from between the fibers by a crude kind of steel or jagged comb. Once the pith is thoroughly dried and hard, it will stand immersion in hot bath waters without softening.

These curious natural-made brushes are only locally known, and are occasionally sold to tourists. They are unknown to commerce in the American brush trade. No attempt has ever been made to establish any industry in them. Yet they are possibly the longest-lived brushes extant. A bath brush used for half a dozen years looked, true, as if it had had plenty of use, but was good enough for another half dozen years.

The fibers and wood are of a bright sandy hue, and, if kept clean, almost preserve throughout their agreeably slight odor, reminding one of dried corn leaves.

SCIENCE NOTES.

The sweet wines generally produced in this country are those in which none, or only a part, of the sugar in the grape has through fermentation been converted into alcohol, the fermentation being prevented or checked at any desired stage by the addition of grape brandy. This adding of alcohol to stop fermentation is called "fortifying." Of the sweet wines, ports and angelicas are the two kinds most largely produced and consumed in this country.

The symbiotic relationship of fungus and root to *Mycorhiza* offers a fine opportunity for careful investigation. The studies which have already been made serve only to put the reader in a state of hopeless confusion. The universal phenomenon of irritability as manifested by tropic phenomena has been a fruitful field of investigation. The general methods of irritable response have been determined; and the best work of such investigators as Haberlandt, Noll, Czapek, Newcombe, MacDougal and others has more recently been directed to the deeper problems relating to the internal mechanism of response and to the exact methods of transmission of the stimulus, as well as to the immediate changes in the cells affected.

The U. S. Biological Survey is engaged in mapping the natural life zones and crop belts of the country for the primary purpose of aiding the farmer to decide what crops are likely to prove a commercial success in his locality. The work is done by studying the geographic distribution of native animals and plants in all parts of the country, and plotting the results on maps showing the distribution of each species. In order to obtain the necessary data the status of the various species must be determined by office study and their ranges laboriously worked out in the field. The progress already made is gratifying, and a large number of maps are now approaching completion. The individual-species maps serve as the basis of a composite map showing the natural transcontinental belts and their more important subdivisions.

The development of viscous flow is largely on the experimental side, particularly for solids, where Weber (1835), Kohlrausch (1863, *et seq.*) and others have worked out the main laws. Stokes (1845) deduced the full equations for liquids. Poiseiulle's law (1847), the motion of small solids in viscous liquids, of vibrating plates and other important special cases, has yielded to treatment. The coefficients of viscosity defined by Poisson (1831), Maxwell (1868), Hagenbach (1860), O. E. Meyer (1863), are exhaustively investigated for gases and for liquids. Maxwell (1877) has given the most suggestive and Boltzmann (1876) the most carefully formulated theory for solids, but the investigation of absolute data has but begun. The difficulty of reconciling viscous flow with Lagrange's dynamics seems first to have been adjusted by Navier.

The overcrowding of the medical profession in Germany is a matter of grave concern. There are now in the empire 29,200 physicians, which doubles the number found in 1876. In other words, there is one physician in Germany for every 1,700 inhabitants. In the city of Berlin 46 per cent of all the physicians have an income of less than $700, and five per cent of the whole number do not have a sufficient income to return it for taxation. On the other hand, in the legal profession in Germany 80 per cent of the lawyers have an income exceeding $2,000. It is estimated that the preparation of a man for the duties of a physician in Germany costs about $6,000, and thus it is seen that the income is often less than 10 per cent of the fixed charge on the capital invested. This leaves practically nothing for the reward of his own personal services, nor for wear and tear.

Within the last decade there has been an enormous increase in our manufacturing interests, so that it is not surprising to find that the output from the factory now constitutes 65 per cent of our annual production of wealth. A study of the figures presented to us in the annual reports of the Department of Agriculture and other branches of the government dealing with agricultural development alone, without reference to statistical matters shows that coincident with the development of factories in a community there has been a corresponding increase in the value of farms and farm lands, as well as of the products of the farm. The great era of manufacturing upon which this country is now entering is bound to have a beneficial effect upon agriculture, for aside from the great possibilities of other industries, it is clear that as factories continue to increase in number and enlarge their output, agriculture must necessarily grow to meet these conditions.

A SIX-CYLINDER 400-HORSE-POWER RACING GASOLINE POWER BOAT.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Great interest is being manifested among naval and marine engineers in Great Britain in the gasoline motor racing boat built by the Brooke Motor Company, of Lowestoft. This craft, although primarily designed for racing purposes, is yet of substantial construction, so that it may be possible of utilization in a seaway. The boat, which is propelled by a 400-horse-power engine, is one of the most powerful craft of its type that has yet been constructed.

The boat is just under 40 feet long, with an extreme breadth of 5 feet 6 inches. The draft at the greatest immersed section of the hull is only 12 inches. In view of the enormous power this launch possesses, and with regard to other conditions, great attention has been devoted to the questions of strains due to propulsion, pounding in a seaway, etc., in the design of the hull.

The motor supports are of ample strength and extend the full length of the launch. In conjunction with the American elm keel they form a substantial backbone to the whole fabric, giving great longitudinal strength and affording a solid foundation for the 400-horse-power motor. A bilge stringer of Oregon pine and two side stringers of slightly smaller scantling are fitted at each side, extending and tapering to the end of the boat. A heavy gunwale of American elm completes the longitudinal distribution of the wood construction. The transverse strength is attained by timbers of selected American elm, considerably augmented by grown oak floor frames, all well molded at their throats and all carried hard up to the bilge stringers at each side. Although the strength of the hull as described above is by no means inadequate, yet it has been increased by the addition of steel angle-bars, stringer plates, and tie angles. The fore part of the boat, as well as the rest of the hull, is fitted with steel frames supplemented with beams or cross-tie angle bars. These frames are very necessary at this part of the hull, for racing launches of high speed and light draft are subject to severe panting stresses and thumping under the bows, as their enormous propelling power drives them into head seas, and they may, unless properly stiffened, bulge in the frames and planking at this locality.

While the diagonal lines of the boat are long and narrow, showing just a slight roundness as they extend from bow to stern, the underwater body has been made fairly flat, merging into a nicely rounded bilge, which in its turn is gradually lost as it approaches the transom. She has been given a very fair freeboard combined with a good fore turtle deck, insuring ample protection in any ordinary weather, and for negotiating bad weather, a light portable structure is fitted over the well, with a small aperture aft for the steersman.

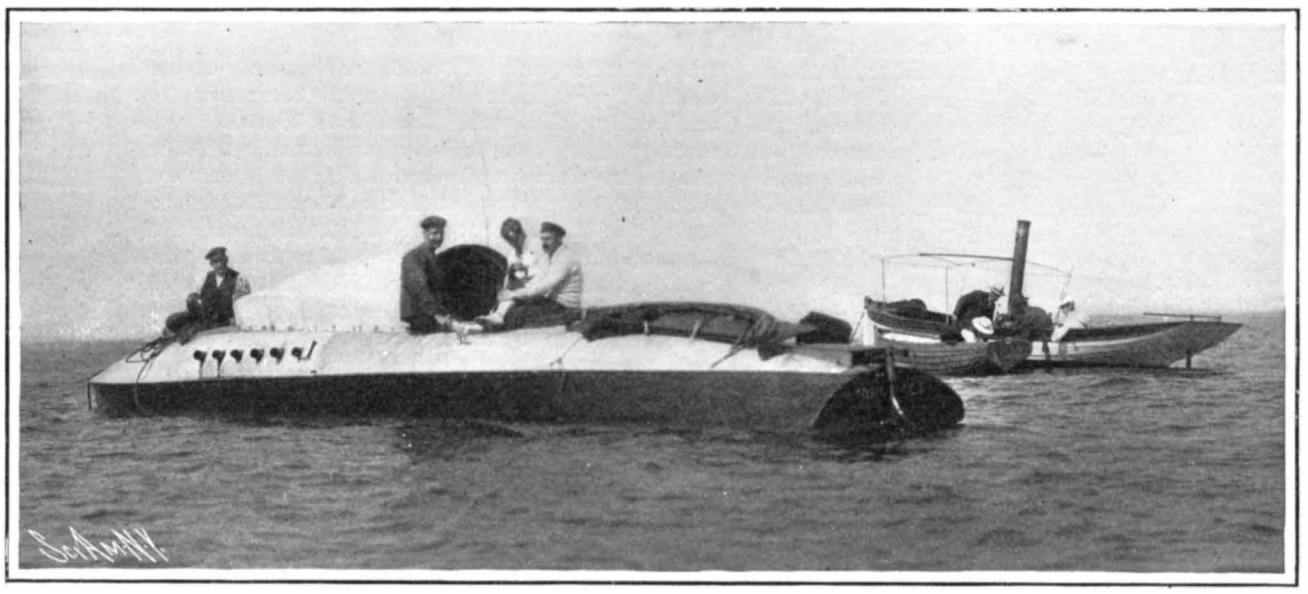
The engine is of the vertical, six-cylinder type, the cylinders cast separately, thereby greatly facilitating their accessibility. The bore is 10 inches, the stroke 8 inches, and at the normal speed of 1,000 revolutions per minute the nominal 400 horse-power is developed.

The cylinders are water-cooled, the jackets being cast with the cylinders. Two entrances are provided in each jacket for the circulation of the cooling water, above the combustion chamber and the exhaust valve. The induction valves are arranged on the starboard side of the engine and are of large diameter with angular seats, and are set down below the main level of the water. The exhaust valves are placed on the opposite side of the engine, and are interchangeable with the inlet valves. By slightly sliding the camshaft operating the exhaust valves, the latter are caused to lift on the compression stroke to facilitate starting. The inlet and exhaust crankshafts are driven by large outside two-to-one gear wheels, and to insure perfect alignment are run in seven bearings each.

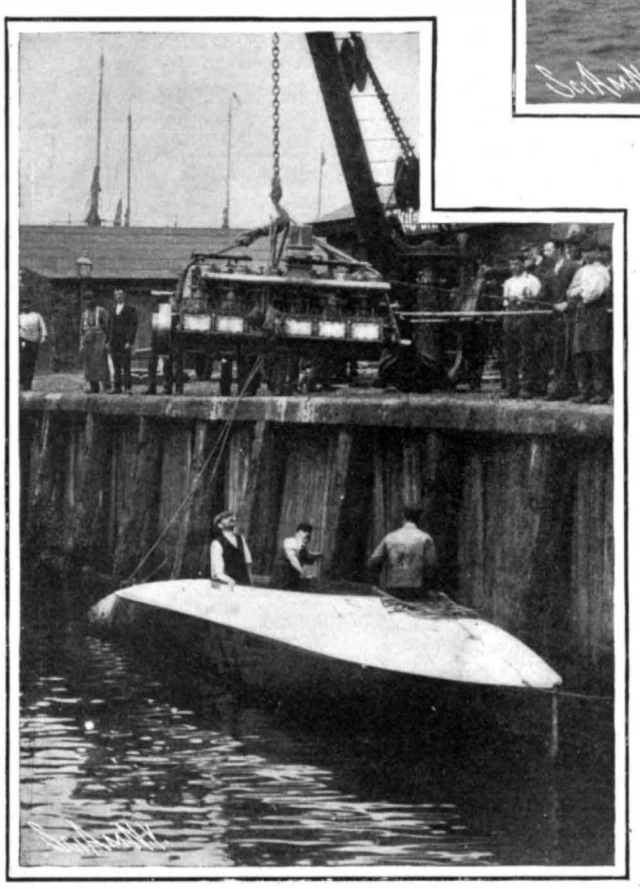
The crank chamber, which is made of cast steel, is formed of two sections, and is provided with six large inspection doors on each side. The crankshaft runs in five intermediate bearings on bored surfaces, and the bolts securing them to the bottom of the crank case extend up through the top of the same, in order to act as the holding-down bolts of the cylinder heads. Two types of ignition are available—low-tension magneto and the high-tension system with accumulators and coil.

Splash lubrication is adopted for the lower ends of the connecting rods and intermediate bearings. The gudgeon pins and pistons are provided with forced lubrication. The motor is fitted with a light flywheel carrying an expanding internal metal-to-metal clutch, which transmits the engine power through universal joints, reverse gear, and thrust block to the propeller.

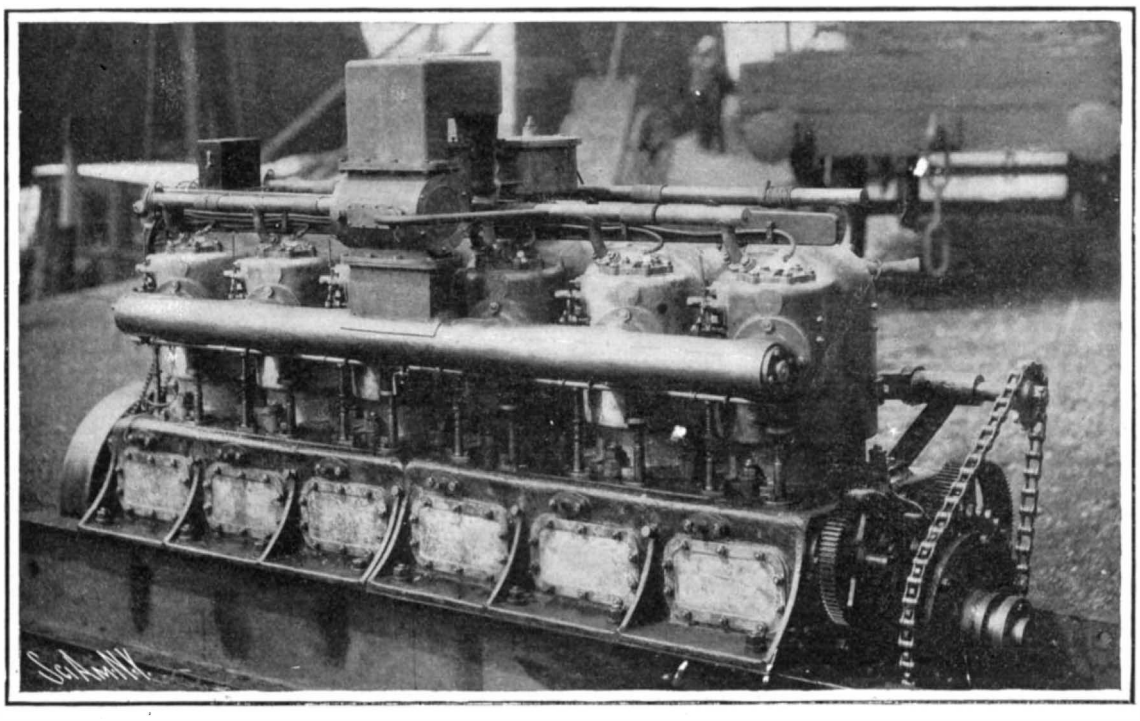
The design of this boat, in which the aim has been to secure the maximum of strength consistent with the minimum of weight, and the high power of the motor, have provoked much discussion in marine engineering circles, and the behavior of the craft in varying weather conditions is being awaited with profound anticipation. It is conceded that this launch provides an interesting development of the application of gasoline engines of great horse-power to small light hulls, and the results of its trials will exercise a far-reaching effect upon the design of this class of craft for various purposes where large horse-power, speed, and light hulls are required.



The "Brooke I."—A 400-Horse-Power Motor Boat.



Lowering the 400-Horse-Power Motor Into the Hull of the "Brooke I."



The 400-Horse-Power Gasoline Motor of the "Brooke I."

MICROPHOTOGRAPHY.

INTERESTING MICROPHOTOGRAPHS OBTAINED WITHOUT COSTLY APPARATUS.

BY D. R. WINSLOW.

Microphotography is a field into which apparently few amateurs care to venture, and yet, in this branch of photography, there will be found more to interest and instruct than in the prevailing habit of promiscuously "snapping" friends, acquaintances, and familiar scenes. The supposed expense of the thing is the foremost reason given by the amateur for letting this interesting branch of photography severely alone. The secondary reason is lack of confidence in his ability to make satisfactory pictures. All that he knows about the subject is the little he remembers having read in articles entirely too technical for his understanding. From these he has absorbed the erroneous idea that the work requires costly apparatus and at least a year of training. The outfit ordinarily considered absolutely indispensable for this branch would cost not less than $300, and to operate such an outfit would require many months of training.

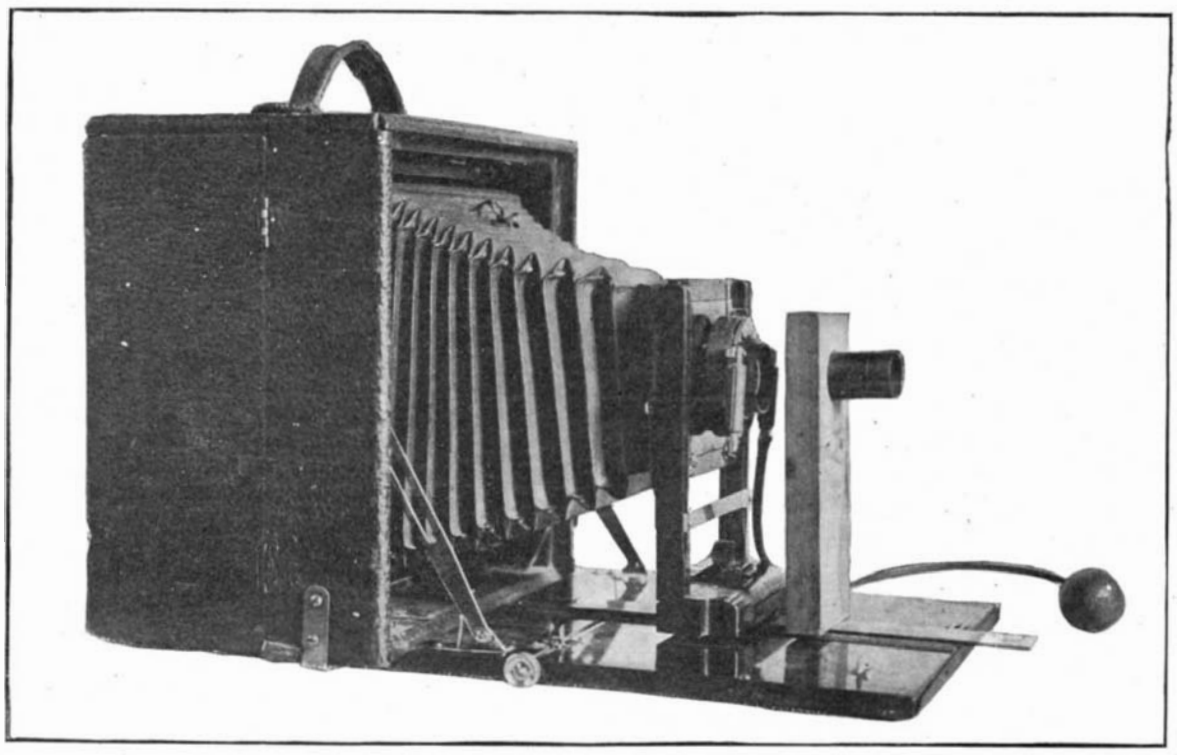
The microphotographs used to illustrate this article were made by an amateur, and the only piece of apparatus used, in addition to his camera, was a small microscope which cost one dollar. With the cheaper microscopes, the kind usually sold for twenty-five cents, pictures equally satisfactory, if not as highly magnified, can be made. No experience is required to make these pictures, and the only preliminary preparation necessary can be made with a sharp knife and a small saw. Any camera may be used, provided it has a ground glass for focusing. It should, however, be furnished with some sort of shutter, as the removal and replacement of a lens cap is impossible.

The microscope need not cost over twenty-five cents. It is the kind that has long been considered a mere toy and often sold as such; a short brass barrel fitted at one end with a magnifying glass mounted on a small stand which slides into the brass barrel, and at the other end with a rather powerful objective, an apparently cubical piece of glass polished on two opposite

sides. The twenty-five-cent glass will give good results, but in the higher-priced glass the magnifying power is greater; therefore larger images will be secured. A mount for the microscope is made of a piece of wood about 2 inches wide, ¾ inch thick and 5 or 6 inches long. At one end a hole is cut large enough to accommodate the barrel of the microscope, making a snug fit. There are various ways of making the hole: a sharp penknife or an auger and compass or bracket saw can be employed, or, in the absence of these, a red-hot stove poker will serve. After the hole has been made the barrel of the microscope is inserted, the edge being flush with one side of the board.

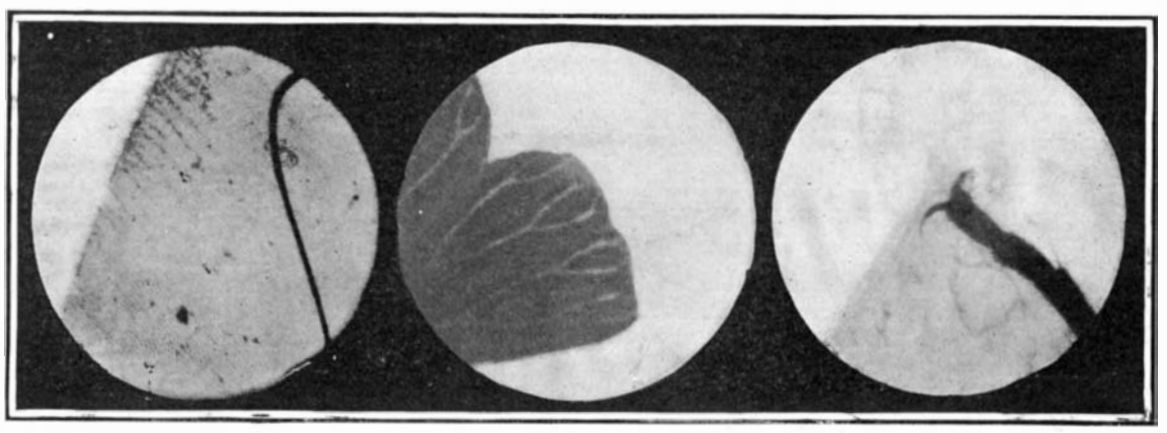
The support, if it has the dimensions given in the above description, will stand alone on its end, and therefore, requires no clamps or braces to attach it to the camera. In use it is merely set up on end on the bed of the camera and in front of the lens board. It is evident from the manner of using the support that its length should be such that when it is set on end on the camera bed the center of the microscope objective will be in line with the center of the camera lens. Unless the camera is provided with a rising and falling front, this length must be accurately measured. If, however, the camera has a rising and falling front the length may be guessed and the front adjusted to the length of the support.

For subjects to be microphotographed the photographer has an almost limitless variety from which to make a selection. Anything that can be seen in the microscope can be photographed, and anything worth seeing in the microscope is worth photographing. The naked eye of the amateur, however, cannot be relied upon in making the selection of subjects; for quite often what to the naked eye appears to be a very unpromising subject is found, when viewed under the microscope, to contain much that is interesting. The insect world will supply subjects by the thousand and in the field of botany many thousand more subjects may be secured. Foodstuffs are worthy of investigation, and the hair, skin and blood of the human body furnish very excellent subjects for microphotography. Mounting the subject is quite simple, as it does not require the skill necessary in work with the compound or professional microscope. Expensive mounting fluids, dyes, stains, etc., are not required, as the subjects are to be preserved on the photographic print and not on glass slides. To mount a subject it is only necessary to lay it on the objective. There is always sufficient moisture on the glass to hold the subject in place, and in the case of parts of insects, there is more or less of a peculiar secretion surrounding them. Only on very rare occasions will it be found necessary to use other means of securing the subject to the objective, and when this is found to be required, a little water will answer as well as any mounting fluid.



The Microscope in Position in Front of the Camera.

In making microphotographs the space between the camera lens and the microscope is covered with a black cloth or a black paper cylinder made to fit the lens hood.



Section of a fly's wing. Section of maidenhair fern leaf. The leg of a house fly.

Microphotographs of Common Objects.

To make a microphotograph, mount the subject on the microscope objective; pull the bellows of the camera out about half way and stand the microscope support on end on the camera bed. The camera should face the window and be as close to it as possible. The distance between the lens of the camera and the microscope depends upon the lens, but a trial will soon regulate the distance. With one lens the support may have to be set an inch from the camera, and with another it may be necessary to have the microscope objective almost in contact with the lens. The correct focus is best secured by moving the microscope backward or forward, although with some lenses it is necessary to manipulate both camera and microscope to secure the best result. Movement of the bellows, in most cases, only serves to increase or diminish the size of the image on the ground glass. The lens should be wide open, that is, no stops should be used. The field being perfectly flat, stops will not help to secure a sharp focus. They will, on the other hand, diminish the size of the circle thrown on the ground glass and, therefore, cut down the size of the picture. The ex-

MICROPHOTOGRAPHY.

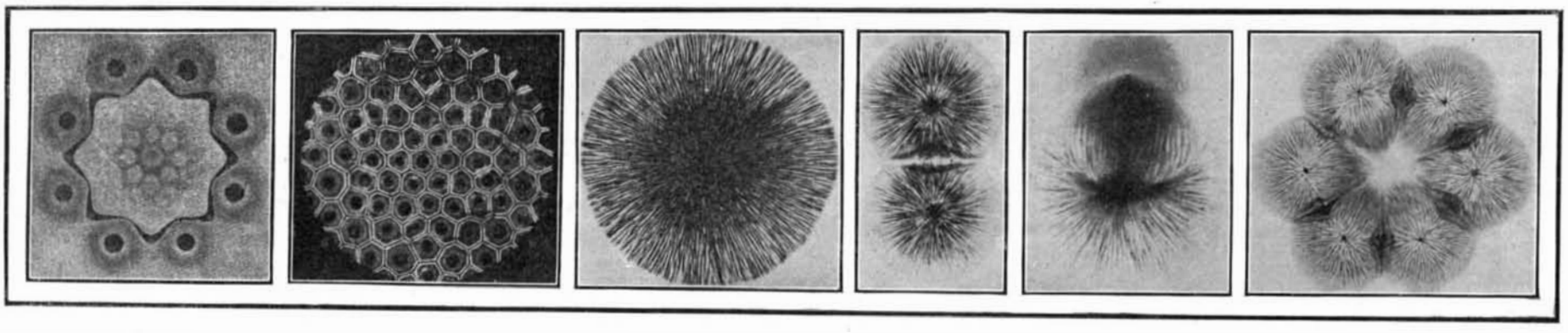


Fig 1.—Figure obtained by diffusion of potassium ferrocyanide and iron sulphate.

Fig. 2.—Artificial cells produced by diffusion.

Fig. 2a.—Monopolar field of diffusion.

Fig. 3.—Bipolar field of diffusion.

Fig. 4.—Field of force of diffusion between two poles of opposite signs.

Fig. 5.—Cellular liquid form due to diffusion of six drops of Na Cl solution colored with India ink in more concentrated solution.

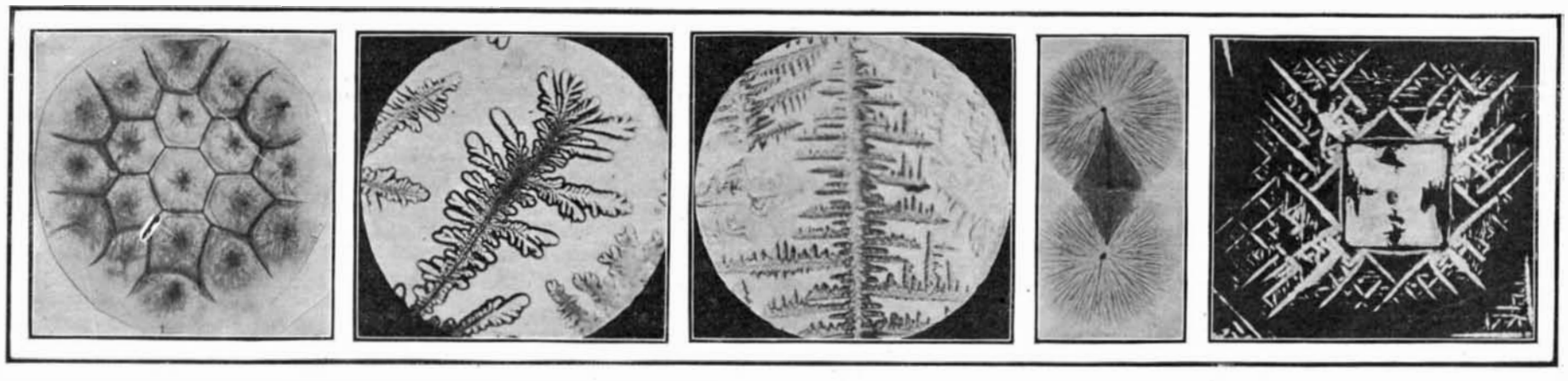


Fig. 6.—Liquid cells produced by drops of a sodium chloride solution colored with India ink and introduced in a less concentrated solution.

Fig. 7.—Fern-like forms illustrating the morphological effect of crystallization.

Fig. 8.—This figure shows the morphological effects of crystallization.

Fig. 9.—Reproduction by diffusion of karyokinetic spindle.

Fig. 10.—Sodium chloride crystals photographed with their field of crystallization.

UNIFORMITY OF ORGANIC AND INORGANIC BODIES.—[See next page.]

posure in microphotographic work, as in all other work with the sensitive plate, depends entirely upon the quantity and quality of the light obtainable. The amount of exposure to give must be judged by the operator, using the appearance of the image on the ground glass as a guide. From thirty to forty-five seconds would be about the right exposure on a bright day with the sun unclouded, using a fast plate. All the light that reaches the plate must come through the microscope objective. To prevent any light getting in between the microscope and the camera lens, the space, no matter how small, must be covered with a piece of black cloth. If the light is very bright better results will be obtained by using a ray-screen. A piece of yellow isinglass hung in front of the microscope will answer the purpose as well as an expensive ray-filter.

First attempts are rarely successful in any undertaking, and microphotography is not an exception to the rule. A few plates must necessarily be wasted and much of the photographer's patience will undoubtedly be lost, but the goal is worth the game. With a little of the "stick-to-it" quality even the very beginner will be successful in microphotography.

UNIFORMITY OF ORGANIC AND INORGANIC BODIES.

BY DR. ALFRED GRADENWITZ.

The present tendencies of scientific investigation are to prove the existence of a continuity, not only between the various branches of the same science, but even between ranges of knowledge which formerly were regarded as widely distant from and entirely foreign to each other. Physico-chemical laws have thus been shown to control the activity of the world of organized beings as they do that of inorganic bodies. There remains, however, the much-discussed problem of the origin of life, and this leaves an unsurmountable gap between organized and inorganic matter. Burke's recent experiments have been interpreted by many as being nothing short of a creation of life from lifeless inorganic matter, though the experimenter himself seems to be far from drawing so bold a conclusion from his interesting results. Nor is the writer inclined to think that the partisans of that theory are right, or that the mystery of life will ever be explained away by physical laws. Very interesting is the work of a French scientist, Prof. Leduc, of Nantes, who has been successful in elucidating the mechanism of the formation of cells and in demonstrating the striking analogies existing between cellular and crystallized bodies. The main factor operative in the formation of all cellular bodies, both inorganic and organic, has been shown by Leduc to be the phenomenon of *diffusion*, which according to him follows a law quite analogous to the law of Ohm.

Leduc's fundamental experiment is as follows:

A ten per cent solution of gelatine is spread in a uniform layer on a glass plate, and after it has become solidified, drops of various solutions forming a precipitate with one another are distributed symmetrically over its surface. Potassium ferrocyanide and copper sulphate or iron sulphate may be used, and these solutions, on diffusing in the gelatine, are precipitated as they come in contact with one another. Now, these precipitates are found to constitute geometrical figures of perfect regularity, strikingly demonstrating the uniformity of diffusion. (See Fig. 1.) The shape of these figures can be varied indefinitely according to the kind, number, and position of the drops and the color of the solutions and precipitates. Contrary to the opinions of previous investigators, it was found that the diffusion goes on more rapidly if the solution is less concentrated. Even the slightest influences, e. g., acidifying or alkalinizing the solution, are shown greatly to alter the resistance to diffusion. The rate seems to be proportional, the remaining factors being the same, to the molecular concentration of the diffusing substances. The shape drawn by the precipitate on the gelatine accordingly depends on the ratio of the molecular concentration or the osmotic tensions. If these are equal, for instance, the forms are rectilinear. From the above facts is inferred a physical explanation for a large number of biological phenomena, which have so far remained mysterious.

Diffusion, as above said, occurs according to a law analogous to the law of Ohm, the intensity corresponding to the rate of diffusion, and the potential difference to the difference of osmotic pressure, the only divergence being the variability of the resistance according to the diffusing substances. Organic membranes are of different permeability to diffusing substances, thus giving rise to the phenomenon of osmosis. Now, the above experiments show that colloids behave, from the point of view of diffusion, in exactly the same manner as membranes.

On repeating the fundamental experiment referred to above, Prof. Leduc succeeded in producing artificial cells (see Fig. 2) of polygonal shape, quite analogous outwardly to natural cells, and in which a cytoplasma and a core could be distinguished. In each cell during its formation, and in fact as long as there is any difference of concentration in the gelatine, lively molecular movements are apparent, consisting as in live cells of a double current, the dissolved substance going from the center to the periphery, and the water from the periphery to the center. This molecular activity, *being the life of the artificial cell*, can be kept up by maintaining in the neighborhood of the latter a convenient medium and by feeding the cell, i. e., reconstituting any losses of concentration.

Three stages may be distinguished in the life of an artificial cell, the first stage being that of organization, when the drop constituting the core forms the cell in connection with the gelatine, giving rise to the production of a cytoplasma and a surrounding membrane. The second stage is the period during which the osmotic pressure tends to equalize the concentration between the various parts of the cell and the medium in which this is placed. The third stage, being that of decay, corresponds to the diminution in the double molecular current due to a diminution in the difference of concentration. As soon as the equality of concentration is established, the active existence of this cell will have come to an end, the cell being now lifeless and conserving only its outward form. These cells are influenced just as are live cells, with respect to their organization and evolution, by moisture, dryness, acidity, alkalinity, or the addition of various substances to either the gelatine or the drop constituting the core.

All the phenomena of diffusion are accounted for on the theory of *field of force of diffusion* suggested by Leduc. If a drop of any aqueous solution be inclosed within a mass of distilled water, the dissolved molecules will be carried away by diffusion in all directions, being replaced by the water, which moves in an inverse direction. The drop thus really is the focus of a field of force, the directions followed by the moving molecules being what may be properly called the *lines of force* of this field.

In connection with the above experiment, the osmotic pressure is stronger in the drop of solution than it is in the pure water; the center of this drop is what is called a *positive pole of diffusion*, while if the conditions are reversed, this is called a *negative pole of diffusion*. Prof. Leduc shows the striking analogies that exist between fields of force of diffusion and magnetic or electric fields by photographing the spectra of such fields. An example is shown in Fig. 4.

A field of force of diffusion exhibits the same behavior as a field of magnetic force, where ether currents, as it were, carry along the iron filings, as the water carries along the globules of the blood or powder particles used as pigment. The phenomena of attraction or repulsion according to polarity also demonstrate this analogy.

Polygonal figures can be obtained by a number of poles of diffusion, giving rise to a cellular structure. The cells thus produced are much more sensitive than those having solid membranes, and respond to any outward influence. (Figs. 5 and 6.)

Diffusion then is the force controlling the phenomena of *crystallization*. If a crystal be formed in a solution, the dissolved molecules will travel toward its core, replacing the water which is carried away; this is what Leduc calls a *field of force of crystallization*. By causing fields of force of crystallization and diffusion to interfere with each other, Leduc has been able to reproduce and to photograph all fern-like and other forms as observed in crystallization. (See Figs. 7 and 8.) The polygonal figures and fern-shaped formations observed on metals, such as antimony, are obviously of the same origin; they are also found to be illustrative of the various forms assumed by the most primitive organisms.

Fig. 9 shows the result of introducing into an artificial cell a very small soluble crystal, with the production of a species of fertilization analogous to this action in a live cell.

The theory of these fields of force in liquids permits a great number of phenomena which had so far been mysterious to be explained on a physical basis, e. g., amœboidan motions, Brownian motions, agglutination, as well as the orientation called tactism and tropism. The hypothesis that live cells have been formed by a similar process, and that the problems of morphology and morphogeny are susceptible of a solution by experimental methods, seems to be warranted by the results of the above experiments.

If a crystallizing substance be added to a colloidal solution, there are obtained in the place of amorphous, homogeneous bodies, regular forms which, while differing from those of crystals, are highly interesting as evidencing the mechanism of crystallization. These forms are obviously due to the presence of the forces of crystallization during the solidifying process. The constant morphogenical action here exerted appears to play an extensive part in nature, as vegetable and animal tissues result from the solidification of mixed solutions of colloids and crystalloids.

In Fig. 10 is illustrated a field of crystallization, as obtained by spreading out on a glass plate a solution consisting of a mixture of a crystallizing substance (viz., sodium chloride) and a colloid. It has been suggested that these fields of crystallization be utilized to characterize the various substances. As will be seen, the field in question strikingly shows two axes of crystallization, with perpendicular lines rising on both sides. The diagonals of the crystal coincide with the axes of crystallization, and all of the four sides forming the projections of the four side faces of the crystal bear prisms constituting another crystal deplaced through 45 deg. with regard to the core. The axes of crystallization of the latter are perpendicular to the four side faces.

Something About Spanish Olives.

The olive industry in Spain is increasing in importance within late years, mainly owing to the efforts which have been made to use improved processes, so as to compete successfully with the Italian industry. One of the leading branches of the olive trade is the preparation of green olives. This is carried out on a large scale at Barcelona. There is a large internal consumption of the olives and besides, the annual exports now reach 7,000 tons. The olives are put up in bottles or kegs. To carry out the pickling process, the olives are well sorted, as only those which show no faults can be kept. They are then placed for several days in cold water, which is renewed frequently. Then they are placed in a brine bath, which consists of a salt and soda solution, and are covered with the liquid. In some cases different aromatic substances are added to the bath so as to give a special flavor to the olives. Ripe or nearly ripe olives are but little in demand and are not consumed to a large extent. As to the extraction of olive oil this has been carried out heretofore by a primitive process. Each small cultivator extracted his own oil by a press which he hired, generally making payment in oil or farm products. The olives were ground up in a horse-mill before pressing. The ground olives were then put in a lever press, using boiling water for the extraction. The presses are of heavy build, but the process is a slow one and the olives need to be stored on hand for some time. They are thus likely to ferment and give an inferior quality of oil. It is estimated that there are some 3,000 or 4,000 of such primitive oil-presses in use in Spain at the present time. The pomace which remained was formerly used for fodder or as combustible, but now it is generally sold and more oil is taken from it by an improved process. Some of the large producers saw the necessity of working on a greater scale and commenced to introduce large cylinder presses and grinding mills, which gave an increase in the quantity as well as the quality of the oil. The use of these machines is now becoming general in the large factories. As to the remainder of the olive oil process, the oil is placed after extraction in large earthenware jars or tin tanks and is then filtered. In some cases the air is kept from the oil by means of a layer of alcohol which is placed on the surface. The inferior grades of oil are used in soap manufacture.

Official Meteorological Summary, New York, N. Y., October, 1905.

Atmospheric pressure: Mean, 30.11; highest, 30.57; lowest, 29.51. Temperature: Highest, 80; date, 9th; lowest, 37; date, 27th; mean of warmest day, 70; date, 5th; coldest day, 44; date, 27th; mean of maximum for the month, 63.5; mean of minimum, 50.3; absolute mean, 56.9; normal, 55.5; average daily excess compared with mean of 35 years, +1.4. Warmest mean temperature for October, 61, in 1900. Coldest mean, 50, in 1876. Absolute max. and min. for this month for 35 years, 88, and 31. Average daily deficiency since January 1, —0.1. Precipitation: 2.67; greatest in 24 hours, 1.60; date, 19th and 20th; average of this month for 35 years, 3.68; deficiency, —1.01; excess since January 1, +1.41. Greatest precipitation, 11.55, in 1903; least, 0.58, in 1879. Wind: Prevailing direction, west; total movement, 8,605 miles; average hourly velocity, 11.6; max. velocity, 48 miles per hour. Weather: Clear days, 15; partly cloudy, 10; cloudy, 6. Frost: Light, 22d and 23d; heavy, 27th, 30th, and 31st.

The Current Supplement.

The current SUPPLEMENT, No. 1558, opens with a well-illustrated article by Frank C. Perkins describing the Crewe Railway Signal. The theory of coherer action is fully described. "How to Build a Small Alternating-Current Dynamo Without Castings" is the title of a most instructive article by N. Monroe Hopkins. Full working drawings accompany the article. Dr. O. N. Witt contributes one of his simply-worded and interesting articles on chemical solubility. The discussion of old age and its causes is concluded. Mr. A. R. Hinks writes on the Milky Way and the Clouds of Magellan. A great many kinds of figs are found in commerce. The complicated biological relations which connect these various figs, and the curious process by which the fruit is developed, are described in an article published in the current SUPPLEMENT. One of the most interesting papers read before the British Association was that by Francis Darwin on the perception of the force of gravity by plants. The first installment of this paper is published in the SUPPLEMENT.

Correspondence.

The Leap-Frog Car.

To the Editor of the SCIENTIFIC AMERICAN:

Suppose the north-going car is exactly on the top of the south-going car, the rate of speed of both being 4 miles an hour, but in opposite directions. Then the south-going car is traveling 4 miles an hour with reference to the motionless ground. But the north-going car? Its rate of speed is 4 miles an hour, but its absolute rate with reference to the motionless ground is equal to its own rate of speed less the absolute speed of the car it is traveling on, that is 4 — 4 = 0. So the upper car is stationary with reference to the motionless ground, and the cars are passing at 4 miles an hour.

A pretty problem is this: Suppose *part* of the north-going car is on the ground rails and part on the south-going car. Assume that part of the north-going car on the ground rails is traveling north at 4 miles an hour, and the south-going car is traveling south at 4 miles an hour. At what rate of speed *relative to the south-going car* is the part of the north-going car which is *on* the south-going car traveling?

J. C. CONSTABLE.

Wick Court, near Bristol, England, September 30, 1905.

[The answer to this question is evidently 8 miles an hour, or the sum of the speeds of the two cars.—ED.]

A Curious Rainbow Phenomenon.

To the Editor of the SCIENTIFIC AMERICAN:

Question 9811 reminds me of an experience I had about the year 1874, in southwestern Wisconsin. I was living on an east and west ridge of high ground sloping both to the north and south. South of me was farming land, visible as far as three and a half miles. North was timber; also on the east and west was timber for one-fourth mile. There had been a shower of rain about 4 P. M. in midsummer, and it was still "drizzling" when I went out into the clearing looking south to see about the weather. I noticed just west of me over the timber a full-sized rainbow with its north end near me. It seemed strange to see a rainbow at that time of day, to westward, so I took particular notice of it, and it seemed to move eastward. I could tell by the color of the foliage on the trees just to westward. In a few moments the colors appeared on the open ground coming eastward and approaching where I stood, at first about one hundred yards away, then closer and closer till I saw them (the colors of the rainbow) all about me, and by extending my hand I could see them between my eye and my hand. The same rate of travel being kept up soon put the colors to the east of me, and on they moved to the end of the field eastward, and there again colored the foliage on the trees to the east, and the circle of the bow appeared smaller as it receded, and after a few moments more it was the usual customary rainbow in the east. I have been seeking for some one ever since who has had a similar experience, but I have found none, and if nothing comes of it through the Notes and Queries column, I will give up trying to find a duplicate case.

JOHN M. IRMEN.

Louisville, Ky., October 21, 1905.

Some Observations of Bird Flight.

To the Editor of the SCIENTIFIC AMERICAN:

I recently found myself in a position to confirm the conclusions about the connection of upward current of air and the soaring of birds, etc., as set forth by your correspondent, J. E. Walker, in your issue of the 14th. About the last days of the past September I was gazing into the sky, and noted an extraordinary number of gossamers going south and rising rapidly. Some that were low showed streamers, and when I procured a field-glass and examined them closely, I found that all such, for hundreds of feet upward, had these streamers pointing almost directly upward from the great bunch or center of the gossamer. This indicated a strong upward current, which seemed to be so local as to have had its origin only about a fourth of a mile northeast of me; but this may have been an erroneous impression. Later, I began to notice an occasional butterfly, of the usual large brown kind, known as the "milk-weed butterfly," sailing rapidly with the current when high up, while later still I saw many making spiral mountings, with not a wing-flap, in the well-known manner of turkey vultures, hawks, etc. The number of these rapidly increased, as did that of the gossamers, as if they had become suddenly aware of the uprush of warm air and determined to take advantage of it. Much later still others of this species came past me, sailing with the wind, at a very rapid speed, equaling that of the usual bird in direct flight. These were all rather low down, some having to rise to pass the tree-tops. I saw no birds taking advantage of this peculiar condition, except that I noted the chimney swifts hawking at very great heights, where the insects had so evidently gone.

Inasmuch as I have always observed vultures, hawks, and other soaring birds engaged in these rising circlings under peculiar atmospheric conditions, usually those just preceding a change, I am inclined to the same view with Mr. Walker—that soaring creatures take advantage of these upward currents; and I am strongly inclined to doubt that they can soar under any other conditions for any great distance in a direct line. It is well known, however, that by drifting away with a strong breeze and constantly circling against it vultures can rise, but this is easily accounted for by the two different shaped surfaces which the bird presents, "going and coming."

JAMES NEWTON BASKETT.

Mexico, Mo., October 18, 1905.

AUTOMATIC APPARATUS FOR WATERING PLANTS.

The essential part of the first device is a long, untwisted wick such as is used by lamplighters. These wicks are about five feet long and the threads of which they are composed are easily separated. The wick is protected by a glass tube about three feet long and about one-quarter inch bore, which is bent in a flame into a siphon or U-shape with one leg very much longer than the other. The wick is drawn through the tube with the aid of a flexible wire, and is allowed to protrude at both ends. It takes up water slowly at first, and the tube containing the wick should be left over night in a vessel of water.

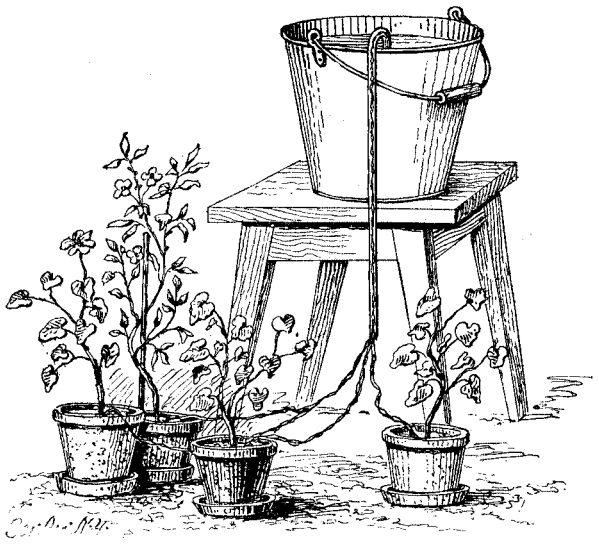


Fig. 1.—AUTOMATIC APPARATUS FOR WATERING PLANTS.

To use this device for watering potted plants, three or four pots are placed near together, and a pail of water is put near and above them, on a bench. The short leg of the tube is immersed in the water and the flow is started by sucking at the other end. The strands of the wick are distributed among the pots, being placed in contact with the earth but not with the stalks of the plants. One or more strands are assigned to each plant, according to its need of water and, of course, the entire flow may be given to one pot, in which case the end of the tube is inserted in the soil. In very hot weather it is advisable to cover the pail and wrap the tube with wadding to prevent the wick drying. The German inventor of this device says that he has always found it to work perfectly. It was designed for watering house plants during the absence of their usual caretakers, but it seems adapted to garden use as well. Furthermore, it is not apparent why a tube of rubber, tin, iron, or lead should not answer the purpose as well as the fragile glass tube.

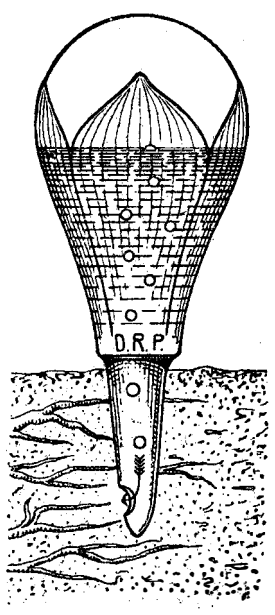


Fig. 2.—AUTOMATIC APPARATUS FOR WATERING PLANTS.

The second device, patented in Germany a few years ago, is still simpler. It consists of a glass bulb pear-shaped a point at drawn out to point itself one end. The near it is a is closed but ing, through lateral open- vessel may which the water. be filled with ed it is When fill- the earth thrust into plant to near the plies the which it sup- tity of water proper quan- days or for several water flows weeks, as the hole with from the less rapidity, greater or the dryness according to The appar- of the soil. atus is furnished in a number of sizes, holding from a gill to a gallon.

Either of these devices offers a convenient means of applying liquid or soluble fertilizers, which may be added to the water in any proportion desired. Adapted from Umschau.

Engineering Notes.

The New York Central Railroad has placed orders with several manufacturing companies for a total of 25,000 freight cars, calling for the expenditure of about $25,000,000. The tremendous scale on which the railroads are now providing equipment indicates the pressure under which they are working to care for the traffic that is being offered to them.

Forced draft dates back of course to Stephenson's "Rocket," and its first use for marine purposes was by Mr. Robert L. Stevens on the Hudson River steamers in our own country prior to the civil war. During that war Mr. Isherwood built a number of gunboats which used forced draft, but it had fallen into disuse until about 1882 for naval vessels, when it was introduced into the English navy, and still later was applied in the merchant service.

The history of early engines has been amplified by discoveries recently made by the Engineer, of London. The oldest known print of a steam engine is in the Birmingham Public Library and shows a machine built in 1712 by Savery and Newcomen. A search made by the journal mentioned has brought to light an old engraving dated 1725 and entitled "The Engine for Raising Water by Fire." It is unique in containing the first illustrated description of a steam engine. This machine is somewhat different from that portrayed in the earlier engraving, for the boiler is fed with a portion of the hot water coming from the bottom of the cylinder or hotwell. This fixes the date of the improvement described by Desaguliers in his "Experimental Philosophy" as follows: "It had been found of benefit to feed the boiler with warm water coming from the top of the piston rather than cold water, which would too much check the boiling, and cause more fire to be needful. But after the engine had been placed some years, some persons concerned about an engine observing that the injected water as it came out of the induction pipe was scalding hot, when the water coming from the top of the piston was but just lukewarm, thought it would be of great advantage to feed from the eduction or injected water, and accordingly did it, which gave a stroke or two of advantage to the engine."

An excellent example of a concrete building in which are embodied new fireproof ideas is furnished by the power house recently completed for the Baltimore Electric Power Company. This power plant, which covers an approximate area of 72 by 180 feet, is considered absolutely fireproof. It rises to a height of 70 feet above the main floor, and every foot of this space is conserved and utilized to the best advantage. The manner in which the concrete is reinforced in this building has many features of interest. Instead of using the ordinary steel rods for the reinforcement of the floor slabs between the I-beams, the engineers selected Clinton electrically-welded fabric, first because with the long lengths in which it comes they were able to make the reinforcing continuous for the whole width of the building. This continuous bond is a great feature in adding strength to the structure. In the second place, the cross wires not only serve to hold the main reinforcing members in their exact positions, but they take up whatever strain may be exerted in the opposite direction. The feature of having a reinforcing material which the workmen cannot misplace is one of the strongest points of this system of reinforcement, because it obviates the necessity of using many high-priced inspectors to watch every detail of the work, and guards against the mistakes which may be made by the misplacing of ordinary reinforcement. The upper third of the building contains the coal pockets. In supporting the great pressure to which these floors are subjected, the continuous bond shows to the very best advantage. As the thickness of the slab is but six inches, it is obvious that but for the continuous bond this floor, with its five-foot spans, must have been heavier and also of the more expensive segmental arch construction. Water is supplied to the condenser from the bay, 600 feet distant, through conduits which furnish a particularly interesting example of the application of Clinton reinforcement. These conduits are five feet in diameter. The entire circumference is reinforced by a continuous bond of wire fabric. These conduits are buried under 30 feet of clay, and the reinforcement is so placed as to resist this pressure on the under side of the four-inch crown. The reinforcement spreads away from the exact circumference on the bottom of the conduit in such a way that the bottom is embedded in the concrete to a depth of 12 inches. The concrete is thus laid in order to resist the upward pressure of the water, as the conduit is several feet below the level of the bay. This application of the Clinton fabric is similar to that in the construction of concrete piles, which to an increasing extent are supplanting the wooden piles.

A VISIT TO A FRENCH GAS WORKS.

BY JACQUES BOYER.

In the evening of the very day on which Napoleon I. was crowned at Notre Dame de Paris, Philippe Lebon, the gifted founder of the manufacture of illuminating gas, was stabbed and killed by an unknown person in the Champs Elysées, which at that time were deserted and unsafe after nightfall. But his invention survived him. The Englishman, William Murdoch, of Redruth in Cornwall, substituted coal, which abounded in that region, for wood, which at the beginning of the nineteenth century had already become scarce and dear. Soon afterward he went to Scotland, where he continued his experiments and lighted with coal gas his property at Old Gunnoch. He next (1803) applied his system of illumination to James Watt's factory at Soho, near Birmingham, and two years later a spinning mill at Manchester also adopted it.

But the timorous talked of the dangers of suffocation and of explosions, to which the gas, which was still imperfectly purified, exposed the citizens. Scientists confirmed these assertions, and the first gasometers erected in London, by Samuel Clegg, so terrified the people that no workman would venture to light the gas jets which had been placed on Westminster bridge. But Clegg soon overcame this difficulty by lighting a torch and applying it to the burners with his own hands. On another occasion, before a committee of the Royal Society of London, he bored a hole in the gas holder and put a lighted candle to it, to the great alarm of the spectators, but without causing the slightest accident. Gradually the eyes even of the most prejudiced were opened to the truth. The German, Winsor, introduced gaslight in France, and Panwells started gas works in the Faubourg Poissonnière. Soon the Carrousel, the Rue de la Paix, the Rue de Castiglione, the Place Vendôme, the Odéon, the Luxembourg, and the galleries of the Palais Royal were illuminated successively with the new light derived from coal.

Let us visit, then, camera in hand, the two most interesting establishments of the Paris gas company—those of La Villette and Clichy. The former is some thirty years old, while the latter, constructed according to the plans of M. Maurice Louvel, is provided with improved apparatus, designed to simplify the operations as much as possible. In fact, although the same general method of gas making is adopted in the nine plants which supply Paris and its suburbs, there are many differences of detail between the works of Saint Mandé and Ivry, which were built in the infancy of the industry, and that of Landy, which is now in course of construction. The latter, when completed, will cover an area of 40 hectares (100 acres), exclusive of an equal space reserved for future extensions, and its 3,000 distilling retorts will produce 400,000 cubic meters (14,124,000 cubic feet) of gas daily.

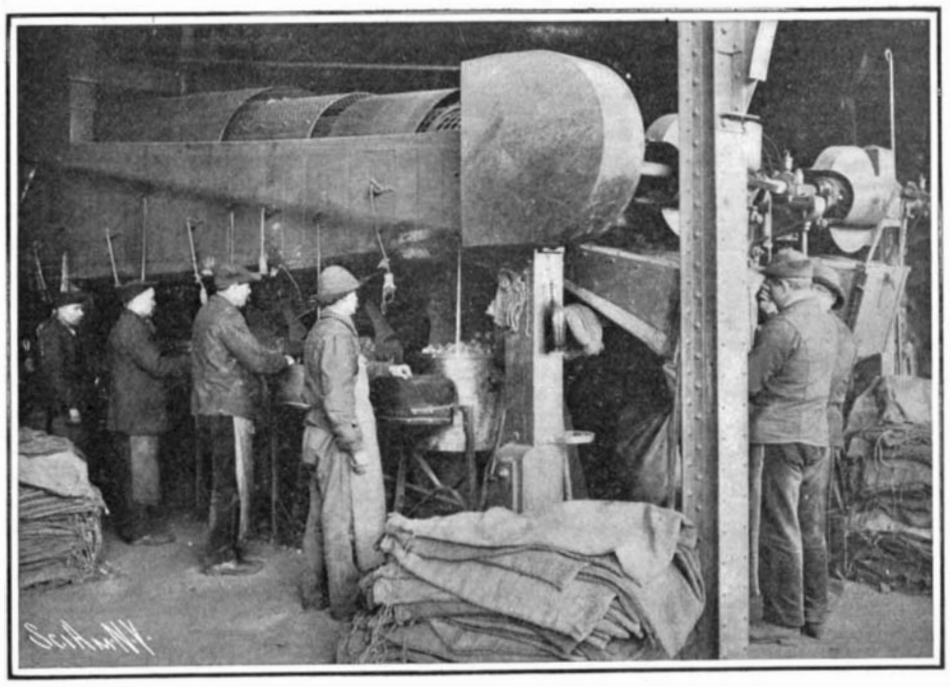


Fig. 8.—"Hectolitres-verseurs," or Measuring Tubs, Used in Measuring and Bagging Coke.

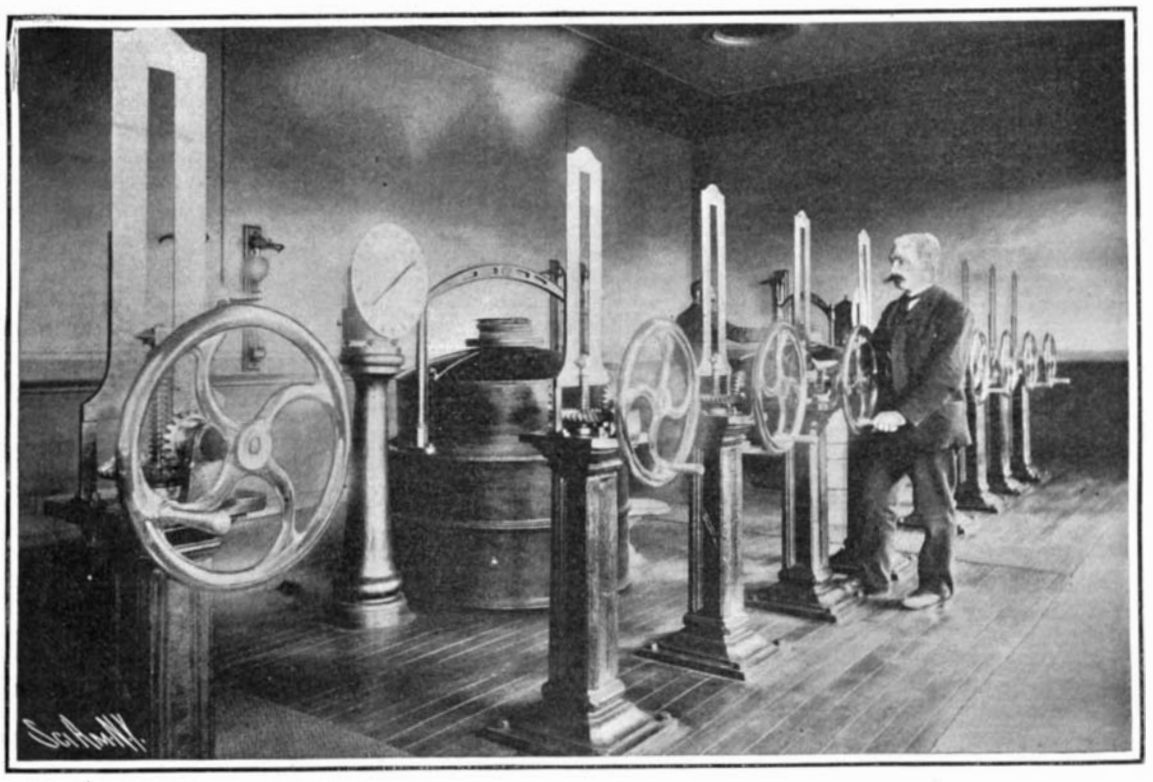


Fig. 6.—Distributing Office, Clichy Gas Works.

In order to save expense for labor, the Paris gas works are located on railways (like La Villette, on the Northern, Eastern, and Ceinture lines), on water courses (like Boulogne and Alfortville), or on both (like Clichy). A track usually runs beside the retort rooms, so that cars may be unloaded very near the furnaces.

At Clichy the coal trains compete with boats (Fig. 1). From the latter, the coal is hoisted to a platform 82 feet above the Seine, where it is dumped into cars, which are drawn to the storage yard by a small locomotive, an operation which is performed very expeditiously. The huge coal heaps are watched very carefully, for they are liable to spontaneous ignition. The temperature of the heap is determined roughly by means of iron rods plunged deeply into the coal.

But in order to obtain gas of good quality, attention must be paid to the character of the coal supplied to the retorts. If this is too hard, the gas will possess little illuminating power; if too rich in bitumen, the apparatus will become clogged with tar. The product of French and Belgian mines is, therefore, blended skillfully with English boghead and cannel coals.

The loaded and weighed cars of the various coals are run into an immense building, where the furnaces are grouped in "batteries," or transverse rows of eight, on each side of a passage 20 feet wide. The furnaces of one battery are in contact with those of the next, back to back. The retorts are

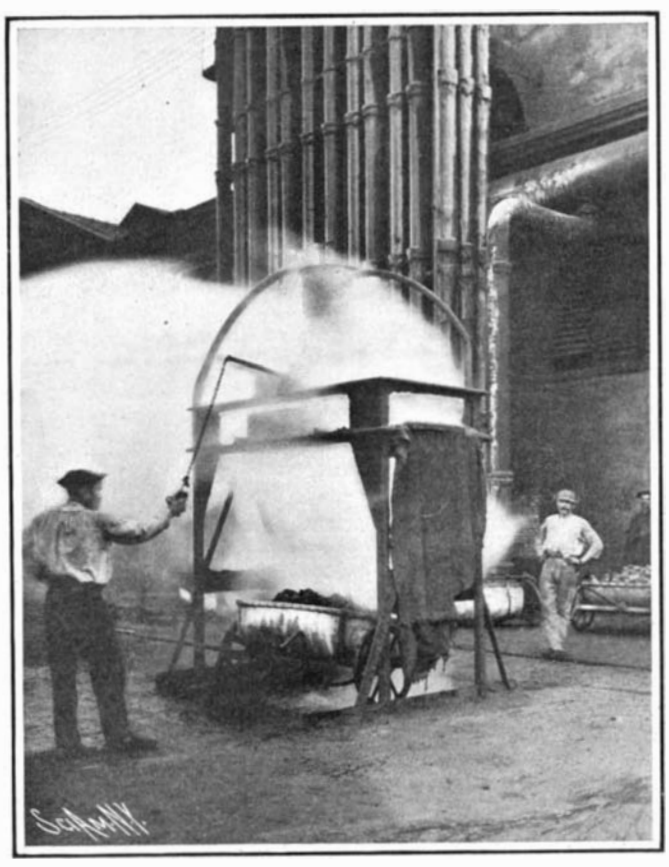


Fig. 2.—Quenching Glowing Coke.

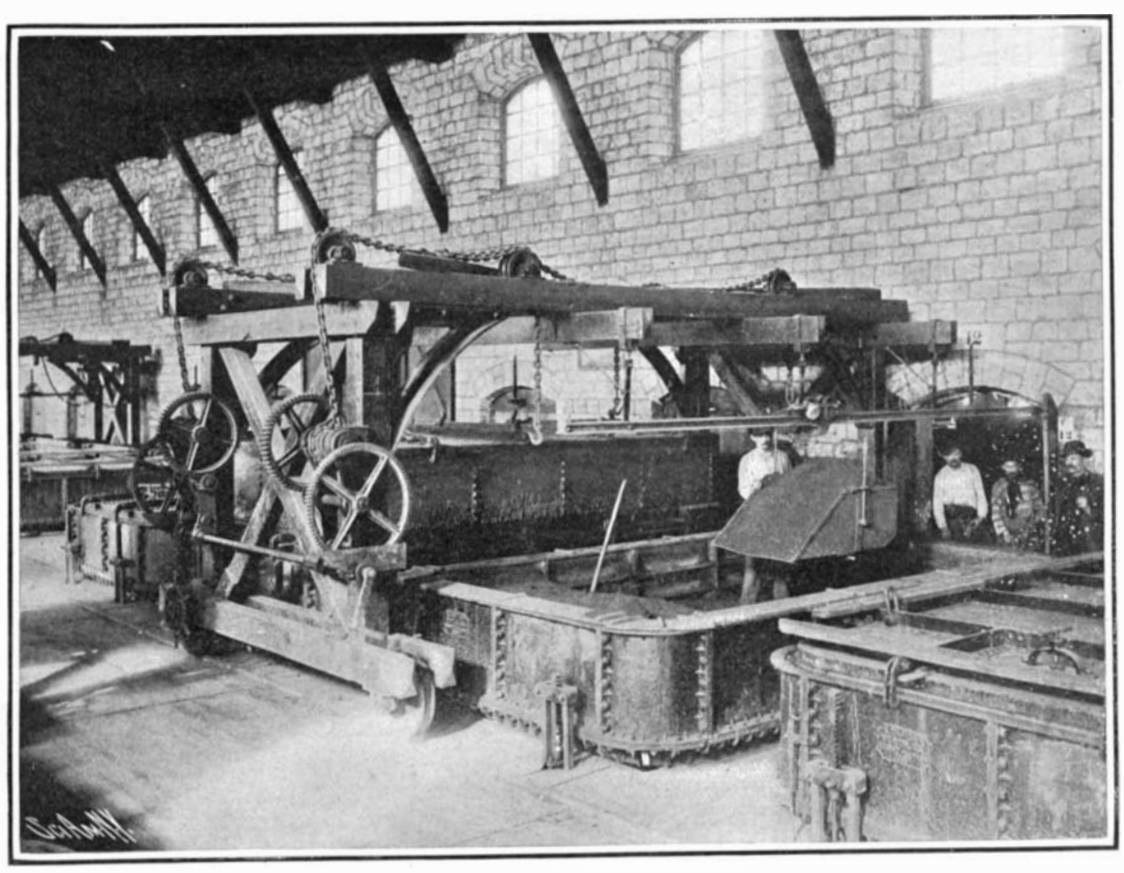


Fig. 4.—Tank for the Chemical Purification of Gas. (Shown Open and in Process of Being Filled With the Purifying Mixture.)

tubes of refractory clay of semi-elliptical cross section and 10 feet long, and are arranged in three tiers.

In the spaces between the coupled batteries, in an atmosphere overheated by the contact of the hot pipes and the frequent opening of the glowing retorts, are the workmen dripping with sweat and covered with black dust. The crew of a battery is composed of two stokers, three retort chargers, three openers, and two coal passers, whose duty it is to bring coke for the fires and coal for the retorts. There is also a man, ironically dubbed "Mylord" in the slang of the trade, who stands by the furnaces, watching for leaks and performing various small and occasional duties.

The work of these men is performed as follows: Three retort men manipulate the "spoon," a hemicylindrical spade exactly 10 feet long, which the passers have filled with 75 kilogrammes (165 pounds) of coal (half the charge of a retort). At the foreman's signal two of the men lift the spoon with the aid of a bar slipped crosswise under it, and the third grasps the handle at the end of the shank. Then all three move toward the retort, in which they deposit the charge in an instant and with mathematical precision. At the proper instant the third man depresses and turns the handle to empty the spoon. In less time than it takes to describe it, the second spoonful is added, and the opener shuts the door of the retort and closes it hermetically by two or three turns of the screw. The men then pass to the next retort, and the entire battery is charged in a few minutes.

About four hours later the sound of a whistle indicates that the foreman considers the distillation finished. The retorts are now opened. An opener, bearing a burning scrap of paper in his hand, approaches a retort and "lights" it, opening the door very slightly to avoid the explosion which a sudden entrance of air would occasion. This done, he opens wide the door, or plug, and proceeds to the next retort. At the same moment a second opener pushes up to the open retort a *marmite*, a heavy sheet-iron vessel mounted on two wheels, and with long pokers rakes into it the 2 hectoliters (5½ bushels) of the coke which form the first residue of the combustion.

Then these men proceed to the yard, dragging after them this white-hot furnace on wheels, which they quench with floods of water (Fig. 2). This task is the hardest work of the whole process. Bathed in sweat, though clad only in cotton jackets and trousers, the men work amid dense clouds of white smoke. They continue this severe labor for six hours through biting winter winds and snowstorms. Stalwart peasant lads of Brittany and Auvergne for the most part, they spend only the winter in Paris and, at the first breath of spring which heralds the approach of the dull season in the gas business, they return to their homes, where farm work in the open air recruits their health.

But let us leave the coke for the present, and return to the retorts. The crew is not idle during the four hours occupied in distilling a charge. The retorts in each tier must be charged, opened, emptied, and recharged in succession, the fires must be fed and kept clear, and when the last battery has been filled with coal, it is time to empty the first. Moreover, the work of these men is not without influence on the quality of the product. Atmospheric conditions affect the draft of the furnaces and, consequently, the rapidity of distillation, which should take place at a temperature between 1,000 deg. and 1,100 deg. C. to produce gas of maximum illuminating power. The proper temperature having been attained, the volatile principles of the coal escape through vertical tubes, which unite in a horizontal collector running around the upper part of the furnace, whence they pass into a common reservoir called a *barillet*, which is a large sheet-iron cylinder half full of water. In its passage through the layer of liquid the gas is partially freed from tar and sulphurous and ammoniacal impurities. From the reservoir the still impure gas is drawn by aspirating pumps through groups of tubes called "organ pipes" (Fig. 3) where, as it cools in its progress, it deposits tar, naphthaline, and other heavy hydrocarbons and another portion of its ammoniacal impurities.

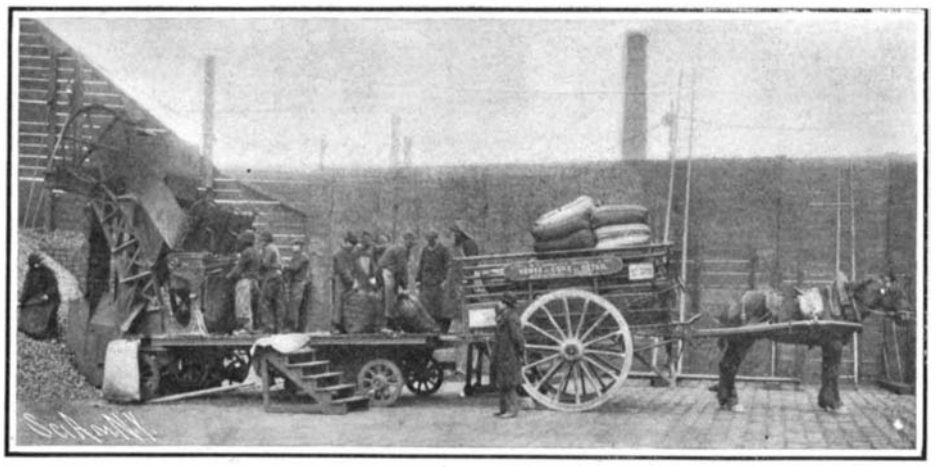


Fig. 9.—Loading a Wagon from the "Drague."

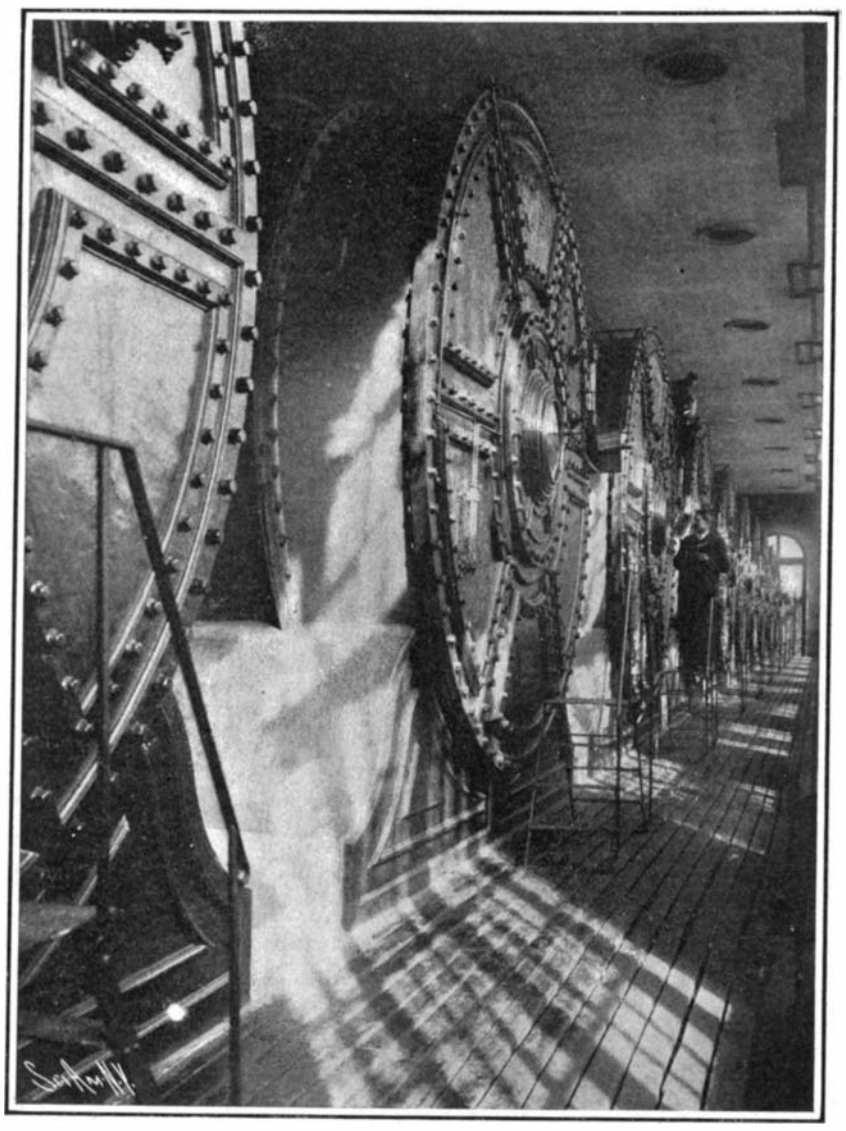


Fig. 5.—The Great Meters of the Clichy Gas Works.

After this first physical purification, the gas, still drawn forward by the same pumps (which at the same time diminish the pressure in the retorts) is freed from the minute drops of tar which it still carries with it by passing rather rapidly through a Pelouze & Audoin condenser. This consists essentially of a series of metal plates with fine perforations which are not opposite each other, so that the tar drops are dashed against the plates and adhere to them.

Now comes the chemical purification, which takes place in sheet-iron tanks, one of which is shown in Fig. 4, in process of being charged with the purifying mixture of sawdust, lime, and oxide of iron. This mixture is spread on sieves, through which the gas passes slowly. To renew the mixture it is only necessary to expose it to the oxidizing action of the air. After it has been used a number of times, however, it is rejected, and then sold to manufacturers of Prussian blue.

The gas is now freed of every impurity which could diminish its luminous power or vitiate the atmosphere of a room in which it is burned, and it is ready for storage and distribution to consumers. First, however, its volume must be measured. In the great hall of the Clichy works (Fig. 5) we see the meters employed for this purpose, through which flow daily, at midwinter, about 400,000 cubic meters of gas. They are ten gigantic sheet-iron cylinders, 13 feet in diameter and height, ranged like so many monstrous casks in a hall 200 feet long. At the center of each, behind a pane of glass, appear figures indicating the quantity of gas received. Now, as the supply pipes are 32 inches in diameter, before the unit wheel has registered one cubic meter the next has entered the apparatus, so that the wheel appears to

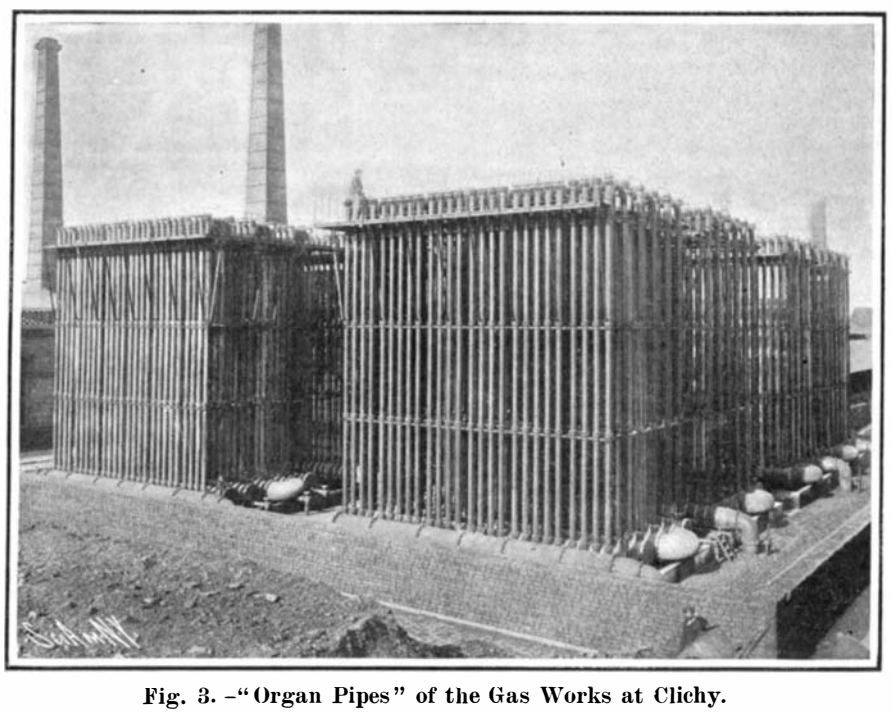


Fig. 3. –"Organ Pipes" of the Gas Works at Clichy.

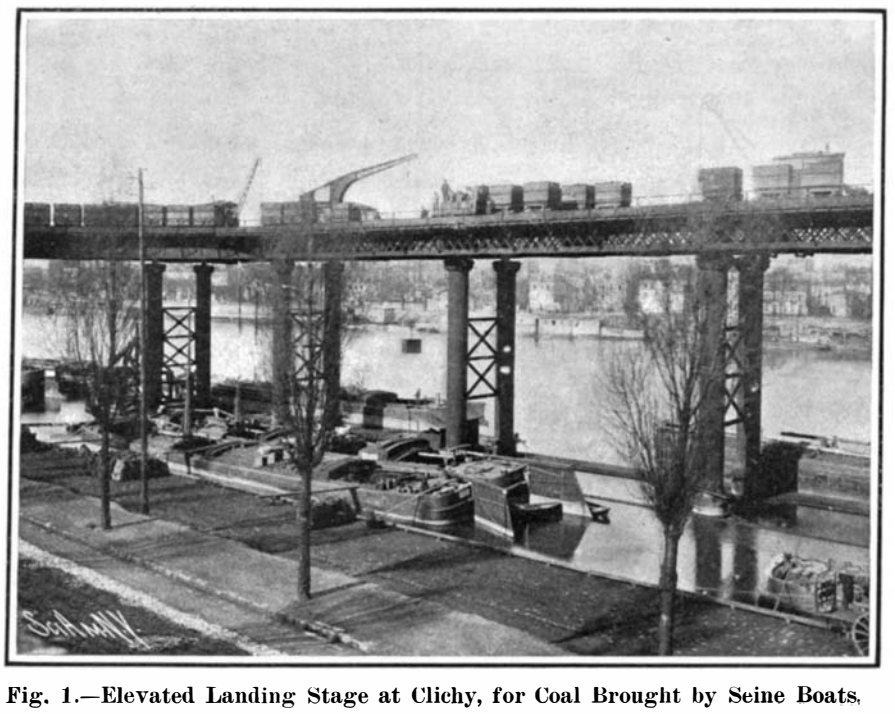


Fig. 1.—Elevated Landing Stage at Clichy, for Coal Brought by Seine Boats.

A VISIT TO A FRENCH GAS WORKS.

be always in motion. The gas next flows into the gasometers, those immense bells of riveted sheet iron with whose appearance everyone is familiar. Their lower edges dip into wells of water, and they can move up and down, guided by rollers which press against columns of cast iron. These enormous reservoirs are fed by jointed pipes, and rise to their full height or sink almost into the ground, according to the quantity of gas which they contain. Each of the gasometers at Clichy is 43 feet high and 178 feet in diameter, holds 30,000 cubic meters (108,000 cubic feet) of gas and costs nearly a million francs ($200,000).

From the gasometers, pipes lead to the distributing office (Fig. 6) where there are three small gasometers furnished with manometers, which indicate the pressure on dials. The pressure is regulated according to the demand by the aid of disks of lead placed on these small gasometers. The mains, the valve gear of which is shown in the foreground, conduct the gas to the 1,540 miles of pipes which ramify through the soil of Paris.

In the works of the Paris gas company the coke is disposed of by means of very efficient machinery devised by the engineers Gigot, Louvel, and L. Bertrand, and driven by electricity.

There are cars and automatic dumping carts, but the most interesting devices are the *convoyeurs*, *hectolitres-verseurs*, and *dragues*.

The conveyor (see front page) is used chiefly in piling up bags of coke. It is composed of a chain with buckets, in which the sacks are placed for transportation to a considerable distance and elevation to a height of 60 or 70 feet. The apparatus is supported by iron columns and girders.

The *hectolitre-verseur*, or measuring tub (Fig. 8), is used in measuring and bagging coke. It is placed under the sieve and operated by one man. When the tub is full it is dumped by means of a handle, but it rights itself automatically. The coke is poured into the sacks through an apparatus having the form of a funnel.

The *drague*, or dredge, disposes coke for city delivery. It is a chain with buckets, mounted on an iron arm which can turn about a horizontal axis, and is so arranged that its weight tends to press the lower part of the apparatus against the pile of coke. The buckets discharge their contents into a hopper, from the bottom of which the coke, freed from dust, runs through three spouts into three *hectolitres-verseurs*. The bagging is done on the platform of the apparatus, which is at the height of a wagon, so that the sacks are easily removed.

Finally, the by-products which result from the distillation of coal constitute an important source of revenue to the company. At La Villette there is a special and mysterious factory for the utilization of coal tar. In this sanctuary, jealously screened from profane eyes, the tar is transformed into benzine, phenol, and naphthalene, from which substances other chemists extract brilliant dyes and delicate perfumes. At Clichy the ammoniacal liquor of the gas works is converted into ammonium sulphate, which is largely employed as a fertilizer.

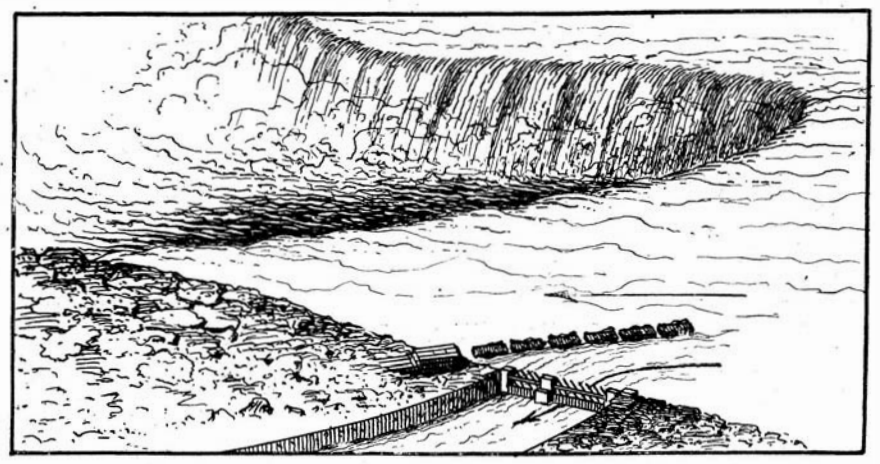
The manufacture of gas, therefore, is now a very successful industry because it involves, so to speak, no waste. The graphite which encrusts the interior of the retorts is used for electric light carbons, crucibles, and lead pencils, and even the ashes of the coke burned in the furnaces are bought by French brickmakers to mix with clay which is too stiff to be used alone.

Nearly all of the best arable land of the country has now been taken up, and those who are most vitally concerned with soil production realize that henceforward the main problem for the man who intends to make cultivation of the soil his occupation will be not so much a question of greater acreage as of greater production from a given acre. If America hopes to continue her phenomenal development, she must be able to produce not only the enormous quantities of food required for her own increasing industrial population, but a large share of the food for other nations as well.

CURIOUS ENGINEERING FEAT AT NIAGARA.

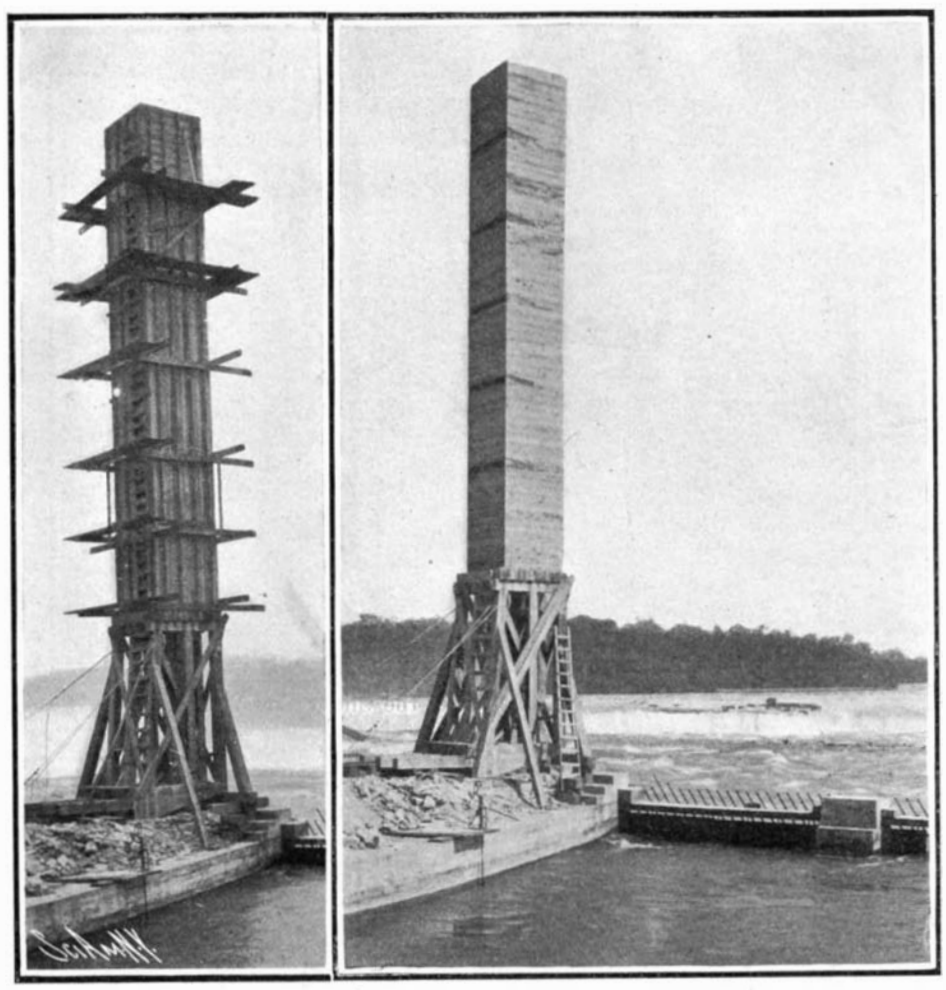
BY ORRIN E. DUNLAP.

The city of Niagara Falls, Ont., has had a great deal of trouble in getting a sufficient supply of water at its intake in Victoria Park. This has been especially true in winter, and several times the Canadian city has had to call upon the city of Niagara Falls, N. Y., to supply it with water for fire and other purposes by means of a line of hose stretched across the lower steel arch bridge. The Niagara Falls Park and River Railway, the electric line that skirts the cliff on the Canadian side at Niagara, and which develops its own power, has also had trouble, the intake being a joint one. Both interests made complaint to the commissioners of Victoria Park, alleging that the water at the joint intake had been lowered by works of construction for power development. The park commissioners held a hearing on the matter, and it was decided to grant a measure of relief. Mr. Isham Randolph, consulting engineer of the Chicago Drainage Canal, was called into consultation by the park commissioners, and he advanced a plan to remedy the alleged trouble.



The Concrete Column After It Has Been Thrown into the Stream.

In carrying out this plan, the park commissioners have constructed a concrete column 50 feet high and 7 feet 4 inches square on top of a trestle that stands 20 feet above the ground level. This column it is proposed to tip over into the river, to form a prostrate column, designed to raise the water level at the intake considerably. The column is made of concrete having proportions of one, three, five, and is reinforced throughout its entire length by a very heavy chain that runs through the center, the chain having a weight of about 800 pounds. The approximate weight of the column is 200 tons. About every eight feet of its height there is a wooden wedge that extends nearly half way through the column, the wedges being about 12 inches thick at the outer edge and tapering to 6 inches toward the center, and the blocks are further separated by strips of tarred paper. The purpose of these several wedges and paper strips is to break the mass in six parts as it falls in order that it may conform to the bottom of the river, while the parts will be held in place by the chain that extends through the center. The scene of the work is only about 600 feet up from the brink of the Horseshoe Fall, but when prostrate the column is not expected to make any difference in the flow of the waterfall. When prostrate, the top of the column will be 20 inches above the level of the ground, and in order that ice may be floated off, an opening will be left between the end of the dam and the river. The column will be tipped by jacks working under timbers at the bottom of the trestle, and when it falls it is expected to tumble slightly up stream. The column will be allowed to dry several weeks before it is tipped into place in the Niagara River.



Column during construction. The concrete column drying out.

Submerged Dam Built on Shore to be Tipped into the River.

CURIOUS ENGINEERING FEAT AT NIAGARA.

Niagara Falls and locality have witnessed many strange feats of engineering, but this construction of a dam up in the air and then tipping it over to the spot desired is certainly very new. However, it well portrays the adaptability of concrete work to peculiar and difficult situations such as those often found at Niagara.

The Bantu.

Roughly speaking, the whole of Africa south of the equator, with the exception of the dwindling Bushman and Hottentot elements, is inhabited by Bantu-speaking peoples, who are extremely heterogeneous, and who exhibit sufficient similarities in physical and cultural characteristics to warrant their being grouped together; the true negro may be regarded as a race; the Bantu are mixed peoples. It will be noticed that as a rule the Bantu approach the Hamites in those physical characters in which they differ from the true negroes, and owing to the fact that the physical characters of Semites in the main resemble those of Hamites, the Semitic mixture that may have taken place will tend in the same direction as that of the Hamitic. The diversity in the physical characters of the Bantu is due to the different proportions of mixture of all the races of Africa. What we now require is a thorough investigation of these several elements in as pure a state as possible, and then by studying the various main groups of Bantu peoples their relative amount of racial mixture can be determined. The physical characteristics of the Bantu vary very considerably. The skin color is said to range from yellowish-brown to dull slaty-brown, a dark chocolate color being the prevalent hue. The character of the hair calls for no special remark, as it is so uniformly of the ordinary negro type. The stature ranges from an average of about 1.640 meters (5 feet 4½ inches) to about 1.715 meters (5 feet 7½ inches). Uniformity rather than diversity of head-form would seem to be the great characteristic of the African black races, but a broad-headed element makes itself felt in the population of the forest zone and of some of the upper waters of the Nile Valley. It appears that the broadening of the head is due to mixture with the brachycephalic Negrillo stock, for, whereas the dolichocephals are mainly of tall stature, some of the brachycephals, especially the Aduma of the Ogowe, with a cephalic index of 80.8, are quite short, 1.594 meters (5 feet 2¾ inches). The character of the nose is often very useful in discriminating between races in a mixed population, but it has not yet been sufficiently studied in Africa, where it will probably prove of considerable value, especially in the determination of amount of Hamitic or Semitic blood. The results already obtained in Uganda are most promising. Steatopypy is not notable among men; fatty deposits are well developed among women, but nothing approaching the extent characteristic of the Hottentots and Bushmen.

The test of a scientific theory lies in the number of facts which it groups into a connected whole; it ought besides to be fruitful in pointing the way to the discovery and co-ordination of new and previously unsuspected facts. Thus a good theory is in effect a cyclopædia of knowledge, susceptible of indefinite extension by the addition of supplementary volumes.

DOUBLE ANIMALS.

BY J. CARTER BEARD.

There not infrequently occur, even among human beings, instances of diphyterous birth in which two individuals are inseparably joined together.

Helena and Judith, the Hungarian sisters, who were born in 1701, and who lived twenty-two years; the famous Siamese twins, who died in 1874 at the age of sixty; the South Carolina negresses, Millie and Christina, who were exhibited at Barnum's museum on Broadway, and the Bohemian sisters, Rosalie and Josepha, are well-known examples, but many others exist. Often the union is much closer and more intimate than in the cases mentioned—so much so, indeed, that the consolidated individuals seldom if ever survive long after birth. Among the lower animals diphytera is, as might be suspected, far more common than it is among human beings, and it is quite possible that by persistent selection and breeding a race of double monsters might be established.

The most curious phase of the phenomenon perhaps, and one that seems to occur occasionally among human beings—though among mankind it is alternate and not simultaneous—is rather psychological than physiological, and consists in a double personality which to all appearances occupies the same physical organism. A case in point among the lower animals is the chameleon, long famous for its power of changing its color at will, a power which popular accounts have often greatly exaggerated.

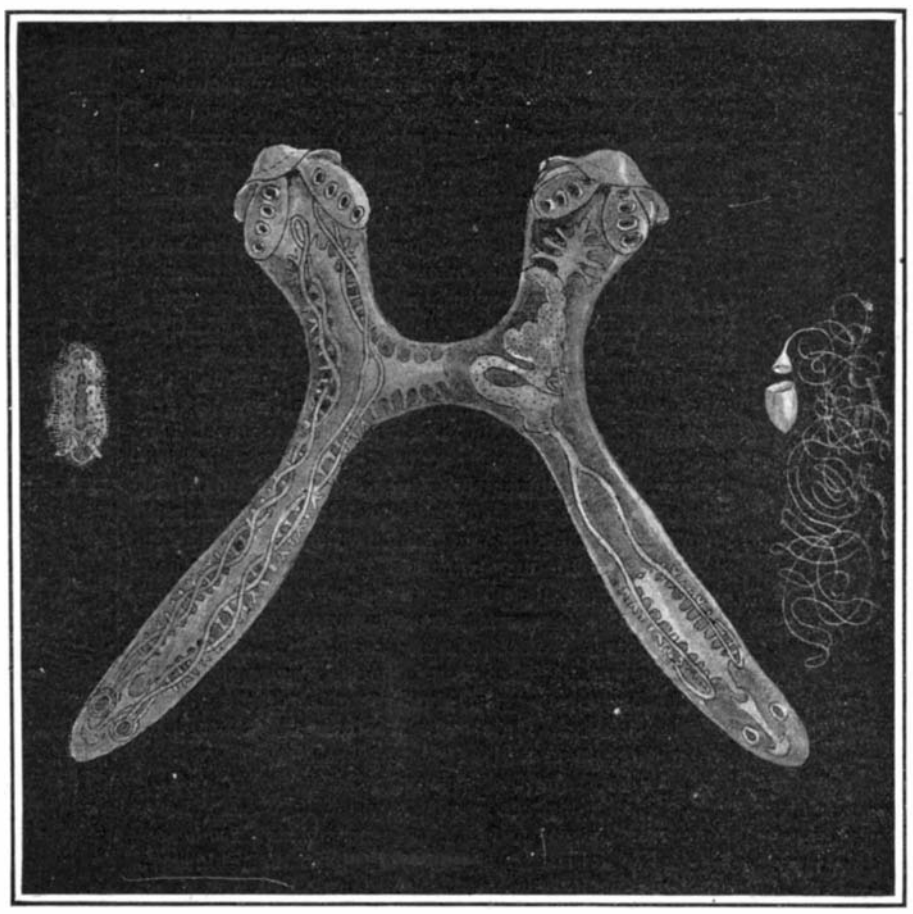
It is certainly a remarkable animal in many respects, nearly allied to no other, and forming a genus entirely by itself.

To all appearances, and according to the researches of those best capable of forming an opinion on the subject, the nervous centers in one lateral half of this animal go on independently of those on the other, and it has two lateral centers of perception—sensation and motion—besides the common one in which must reside the faculty of concentration. Notwithstanding the strictly symmetrical structure of the chameleon as to its two halves, the eyes move independently of one another and convey separate impressions to their respective centers of perception. The consequence is that when the animal is agitated its movements resemble those of two animals, or rather perhaps two halves of animals glued together. Each half wishes to go its own way and there is no concordance of action. The chameleon therefore is the only four-legged vertebrate that is unable to swim; it becomes so frightened when dropped into water that all faculty of concentration is lost and the creature tumbles about as if in a state of intoxication. When a chameleon is undisturbed every impulse to motion is referred to the proper tribunal and the whole organism acts in accordance with its decrees. The eye, for example, that receives the strongest impression propagates it to the common center, which then prevails upon the other eye to follow that impression and direct its gaze toward the same object.

The chameleon, moreover, may be fast asleep on one side and wide awake on the other. Cautiously approached at night with a candle so as not to awaken the whole animal at once, the eye turned toward the light will open, begin to move, and the corresponding side to change color, whereas the other side will remain for a longer or shorter time in a torpid, motionless, and unchanged state with its eye fast shut.

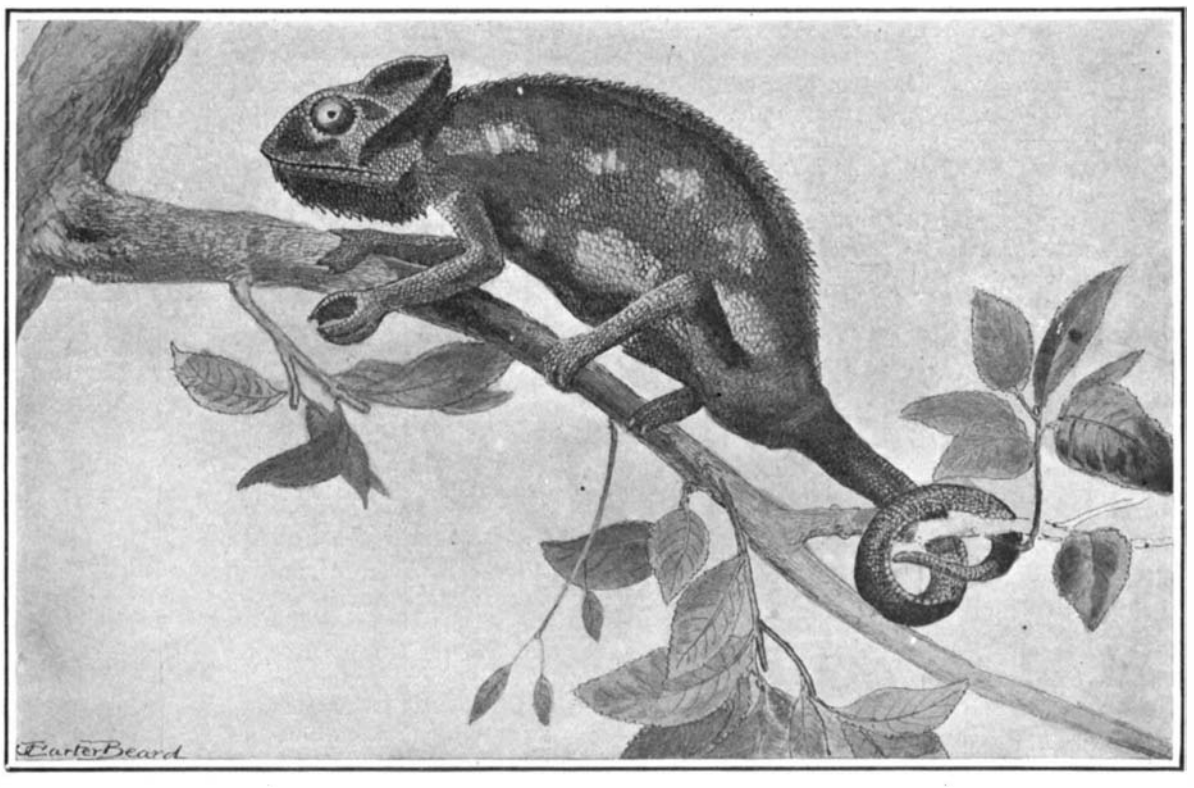
Another most remarkable instance of the double animal is one in which two individuals are born separately and afterward become one indivisible being. This is the case with the *Diplozoon paradoxum*. The little creatures begin life as two solitary and distinct individuals. When young they are called diporpa, a name given them by naturalists before the life history of the minute animals was known, and they were supposed to be adult specimens. Their appearance at this stage of their life is shown on the left of the illustration, a little while after they have left their strangely shaped eggs, each of which parts near the top into two sections, to the upper one of which is attached a long tangle of thread. One of these eggs is shown on the right of the accompanying drawing. The diporpa is ciliated and free-swimming, and exercises its power of movement in roving about in search of a home which it finds, if at all, on the gills of some fresh-water fish—the bream, the gudgeon, or the minnow—from which it derives its nutriment. Meeting or being joined by others like itself, it selects a companion to which it is no figure of speech to say that it becomes greatly attached.

There is upon the back of each of the animals a sort of a knob, and opposite to it a sucking apparatus by means of which it is able to fasten itself securely to any surface to which it wishes to adhere. When two of the animals become a single individual, they do so by twisting over so that each seizes the knob of its companion with its sucker, and thus situated they actually grow together as shown in the center figure of the cut. The knobs and suckers are completely fused, but otherwise the twin animals remain independent. This double trematode well deserves its name of *Diplozoon paradoxum*.



The Curious Double Animal Diplozoon paradoxum.

To the left appears the young animal or Diporpa before becoming double; the right, the egg of Diplozoon from which the single animal is hatched.



Chameleon, Showing the Side That is Awakening and Beginning to Change. Its Other Side is as Yet Fast Asleep and Motionless.

DOUBLE ANIMALS.

Artificial Train Oil.

Under this descriptive title we understand a dark product derived from rosin-oil and one that is widely used in commerce playing at the same time no inconsiderable part in the smaller chemical branches of trade and industry, says Chemische Revue.

The light-colored train oils known in commerce under the name of fish oil or blubber are, as a rule, pure train oils, or, at the worst, somewhat adulterated, but rarely if ever purely artificial products. In the main the dark oils are derivatives of rosin oil and their production is attended with some difficulty because of the demands put forward by consumers, which are extremely strenuous.

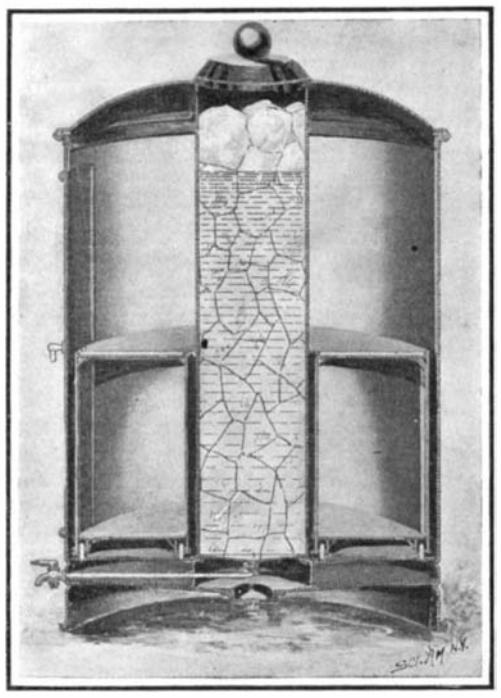
As a criterion by which to judge the quality of the artificial train oil we are compelled to enumerate the following characteristics: Color, odor, viscosity, its feel on the surface, and, of course, absence of gloss; as for the color, it must show a light-brown shade when the light falls upon a thin film of it. It must also be perfectly clear and possess a consistency not greater than syrup. When rubbed between the thumb and fingers it must disclose a great degree of lubricity and yet not be sticky, such as, for example, any presence of mineral, sperm oil, or paraffine oil causes. In competition with the foreign oils it is very difficult indeed with the prices prevailing at present to produce an artificial train oil in Germany from domestic products which is capable of meeting all these demands. The chief ingredient in the production of artificial train oil is the so-called rosin stock oil. Conforming with the characteristics of the oil to be made this should be thick-flowing and possess the least possible odor and gloss. The lighter and clearer the rosin stock oil is, the better it is adapted for the manufacture of train oil. A cloudy and for that reason also a darker rosin oil is less suited for the purpose. Blue oil constitutes the next most important raw material from which to make our train oil, of which the properties, properly speaking, are of more consequence for the purpose than those of the rosin oil. The very pungent odor and high fluorescence, particularly of the blue oil of Galicia, are as a rule so difficult to remove that we have at the start the fundamental reasons for the inferiority of the final product.

Less important as raw materials are nitric acid and molasses, by means of which nearly all the artificial train oils are made. First a mixture of two parts of rosin oil and one part of blue oil is prepared—these ratios varying according to the desired viscosity—to which is added only pure and rather concentrated nitric acid, which probably deprives the mixture of its natural fluorescence through the nitro compounds formed with the hydrocarbons of rosin oil, besides deodorizing it and turning it dark. From 1.5 to 2 per cent of nitric acid is sufficient for the purpose, viz., to deodorize it and kill fluorescence. The smell of rosin oil does not disappear entirely, which indeed is of little moment, for in the finished product it is not unlike that of the natural train oil. The addition of from 2 to 4 per cent of molasses also assists the color as well as in disguising the odor. During the whole process the temperature in the kettle—an open kettle and a direct fire are imperative—must be kept from 60 to 80 deg. C. When the product has the desired appearance the fire is drawn and contents of the kettle allowed to cool.

Patent Department

WATER COOLER AND REFRIGERATOR.

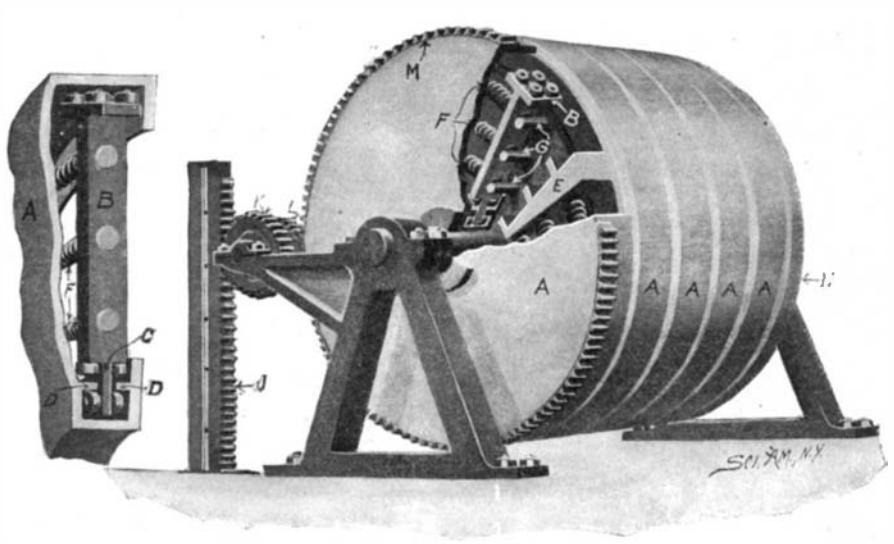
A recent invention provides a water cooler formed with a casing, in which various articles may be stored and kept cool by the ice of the water cooler. This combined water cooler and refrigerator occupies comparatively little space, and is thus particularly adapted for use in dining cars, restaurants, sample rooms, and the like. The construction of the device is very simple, and is clearly shown in the accompanying section view. The water cooler consists of a vertical cylinder, which is centrally supported in a large drum. The latter serves as the refrigerator, and is provided with a door at one side, through which access may be had to the interior. A pipe leading from the water cooler to the faucet on the outside of the refrigerator passes between the bottom of the drum and a false bottom consisting of a perforated plate. This plate supports a rack, which is designed to rotate around the water cooler. In order to permit easy movements of this rack, it is provided with rollers which fit into channels formed in the false bottom, as shown. The rack consists of two ring-like plates supported by a number of posts. The various articles to be cooled are laid on these plates, and as the rack can be rotated about the cooler, any desired part of it can be brought within easy reach. The water of condensation will pass through the perforated false bottom to the concaved bottom of the drum. At the center of this bottom wall is a large opening normally closed by a cap, in which there is a trap. The trap may be opened to drain out any water which has collected in the drum. When it is desired to clean the water cooler the cap is removed, giving access to the coupling between the water pipe and the cooler. When this coupling is released, the water cooler may be lifted bodily out of the drum casing. The inventor of this combined water cooler and refrigerator is Mr. John W. Brown, of Knoxville, Tenn., P. O. Box 23, Station A.



WATER COOLER AND REFRIGERATOR.

TRANSMITTING DEVICE.

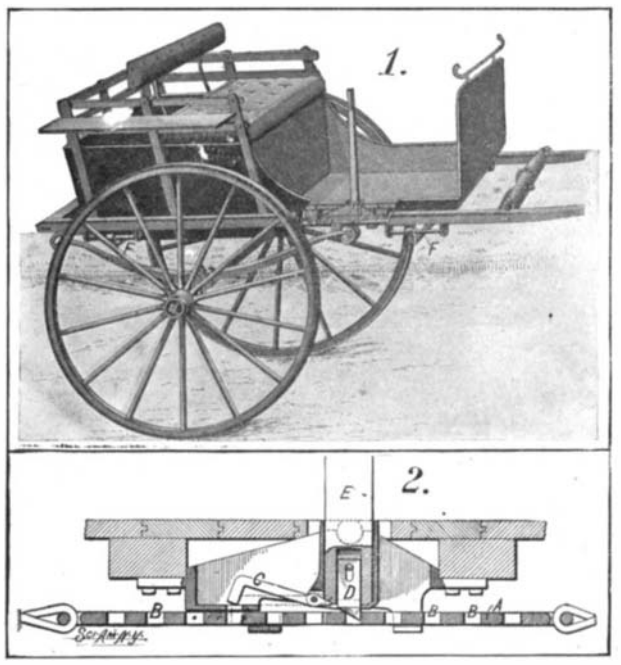
There are certain sources of power which have a very limited value, chiefly because of their intermittent or irregular character. Windmills, for example, vary with every gust of air, and wave motors must obey the whims of the ocean. The value of the power developed would be greatly increased, were some intermediary mechanism provided between the source of power and the work, which would absorb sudden variations, shocks, etc. This intermediary would also permit the coupling together of a number of these variable prime movers without loss of power. The power of several windmills, for instance, could be combined to operate a single machine. Such an intermediary mechanism has just been invented by Mr. Frederick S. Keyes, of Warren, Mass. As illustrated in the accompanying engraving the device comprises a series of wheels, mounted to turn freely on the driving shaft, and connected by spiral springs. Each wheel consists of a shallow drum, *A*, open at one side, and within which a series of movable abutments, *B*, are mounted. These abutments are radially disposed, and are provided with rollers at each end, adapted to bear against the side walls of the drum. At its inner end the abutment is formed with an extension, *C*, carrying rollers which bear either on the hub of the wheel or on a pair of annular flanges, *D*, projecting inwardly from the side walls. Aside from the movable abutments, each wheel is formed with a relatively stationary abutment, *E*. The movable abutments serve as connecting members between the sections of circularly arranged spiral springs, *F*, which lie concentric to the hub. On the outer face of each wheel a series of lugs, *G*, are formed, which project into the next adjacent wheel. The last movable abutment, or that at the end of the springs, bears against these lugs, as shown in the illustration, so that when one wheel is rotated, it acts upon the next through a cushion of springs, and the second wheel in turn transmits the power through a cushion of springs to the third wheel, and so on through the entire series. The purpose of dividing the springs into short sections by means of the abutments will be apparent. Buckling is entirely prevented, and friction of the springs against the sides of the wheels is thus obviated, while owing to their roller bearings the abutments are given perfect freedom of motion. In our illustration the mechanism is shown as applied to a wave motor. The rack, *J*, which is attached to a float, receives vertical reciprocating motion from the action of the waves, and imparts this to the pinion, *K*. This pinion is connected to pinion, *L*, by a ratchet clutch, which transmits motion in one direction only. The pinion, *L*, meshes with teeth, *M*, on the first wheel, *A*, causing the same to turn intermittently, but in a constant direction. The last wheel of the series engages a set of lugs on the disk, *N*, which is keyed to the main shaft.



TRANSMITTING DEVICE.

BALANCE ADJUSTER FOR VEHICLES.

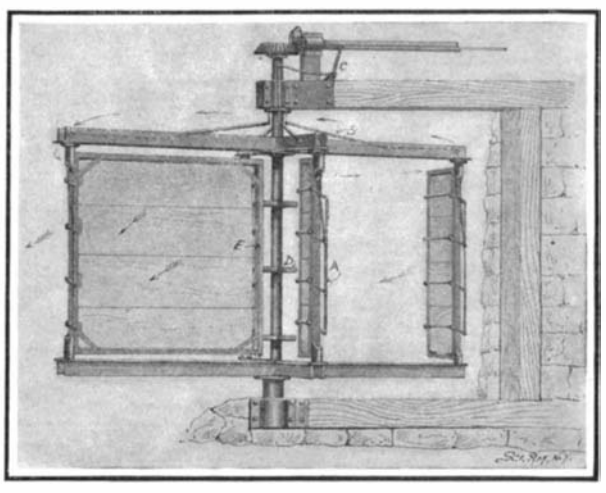
Two-wheeled vehicles, while very convenient and useful for certain purposes, yet possess the serious fault that they cannot at all times be perfectly balanced over the axle. If the forward end is overweighted an unnecessary load is imposed upon the horse, and if the rear end is overweighted the tendency will be to lift the horse off his feet. To remedy such conditions Mr. Patrick J. McGinn, of Salisburg P. O., Rhodesia, South Africa, has invented a vehicle which may be readily adjusted to the proper balance. The accompanying engraving shows this vehicle with a portion of the body broken away to reveal the adjusting mechanism. It will be noted that the body of the vehicle is not directly supported on the frame, but rests on front and rear straps which are slidably mounted on the side rails of the frame. This permits the body to be moved backward or forward with respect to the axle. Beneath the floor of the vehicle a bar, *A*, is mounted which is held in place by means of two rods anchored respectively to the forward and rear cross bars of the vehicle frame. The bar, *A*, is formed with rectangular openings, *B*, as indicated in the section view, Fig. 2. Directly above the bar, *A*, is a bracket which is bolted to the under side of the floor. A socket piece adapted to receive the lever, *E*, is formed with trunnions, which are mounted in bearings in the side walls of the bracket. A dog, *C*, is hinged to the bottom of the socket piece. The normal position of this dog is indicated by dotted lines in Fig. 2, which shows its outer end projecting through an opening in the bottom wall of the bracket and engaging one of the rectangular openings, *B*. When the lever, *E*, is inserted in the socket piece, it engages a projecting toe of the dog, *C*, lifting the latter to the position illustrated by full lines. Mounted to slide vertically in the end of lever, *E*, is a pinch-block, *D*, which projects through the socket piece and engages one of the openings, *B*. It will be observed that the lower face of the block, *D*, is inclined. Now, when it is desired to adjust the body of the vehicle, the lever, *E*, is inserted as illustrated, lifting the dog, *C*, and then when the lever is swung to the rear the pinch-block, *D*, serves as a fulcrum, so that the body of the car is moved rearwardly. When the lever is swung forward, the block, *D*, owing to its inclined face, is lifted out of engagement with the opening, *B*, and falls into the next opening to the rear. The lever, *E*, may then be operated to slide the vehicle body still further back. If it is desired to move the body forward the lever is placed in the socket in reverse position, so that the lower face of the block, *D*, inclines toward the rear. Then on moving the lever forward the body will be moved forward on the frame.



BALANCE ADJUSTER FOR VEHICLES.

AN IMPROVED WATER-CURRENT MOTOR.

A water-current motor of simple construction has recently been invented, which is provided with an efficient means for governing the speed or power developed. The motor is designed to be submerged well below the surface of a stream, so that it will not be in the path of driftwood or rubbish coming down with the current and will not be affected by the rise and fall of the current at different seasons of the year. The construction of the motor is clearly illustrated in the accompanying engraving. A pier of masonry is built out from the bank of the stream and supports an upper horizontal beam and a lower sill. A shaft is mounted to turn in bearings in the sill and beam. Rigidly secured to the shaft near its opposite bearings are a pair of blocks from each of which four arms or spokes radiate. Mounted between the upper and lower sets of spokes are four frames which, with the vanes they carry, serve as wings against which the current acts. The wings, which are indicated at *E* in the engraving, are hinged to the outer extremities of the spokes. On the main shaft of the current motor are a number of collars, *D*, formed with teeth adapted to stop the inner ends of the wings as they are swung against them by the current. It will be evident that the wings on one side of the main shaft will be forced against these stops by the weight of the current, while those on the other side will swing free from the shaft, assuming a position parallel with the direction of the current, and thus offering no appreciable resistance to the flow of the stream. The motor is thus caused to rotate, and the motion is transmitted by means of suitable gearing to any point desired. It will be noted that the vanes of the wings, *E*, are formed with trunnions which extend into the vertical posts of the frames. The trunnions at the outer ends carry cranks which are attached to connecting rods, *A*, so that when these rods are raised



AN IMPROVED WATER-CURRENT MOTOR.

the vanes will be swung open. Levers, *B*, are fulcrumed in the upper spokes and to their outer ends the connecting rods, *A*, are attached by means of links. Loosely mounted on the main shaft is a collar to which the inner ends of the levers, *B*, are connected in such manner that they can be raised and lowered by shifting the collar on its shaft and yet are free to revolve about the collar, which is kept from turning. A rod connects the collar with a bell crank, *C*, which, in turn, is connected to a ball governor not shown in the illustration. This governor, which is of the usual centrifugal type, is geared to the power shaft of the motor and operates to automatically raise or lower the rods, *A*, thus controlling the inclination of the vanes, and regulating the speed of the motor by varying the surface area on which the current can act. In this way uniform action of the motor is secured regardless of the speed of the current. The machine may be used as well at the mouth of a harbor, for the wings are self-reversing and will adjust themselves to the ebb and flow of the tide. Mr. H. H. Granger, of Davenport, Wash., is the inventor of this improved current motor.

Brief Notes Concerning Patents.

Ever since the present sewing machine was brought to perfection, efforts have been made to devise a system whereby sewing may be carried out direct from two reels of thread, thereby dispensing with the winding of spools and threading of shuttles, but with indifferent success. The problem, however, has now been solved by Mr. Dennis Flanagan, a Lancashire mechanic, after some fourteen years' continuous experiments. The feature of this invention is the distinct simplification of the sewing machine, there being a small number of parts. There are no vibratory or eccentric motions, every movement being positive in its action. As there are no spools to wind, the loose balance wheel is dispensed with. As a reel of cotton is regularly wound a uniform stitch is obtained, while the double take-up gives an elasticity to the tension. The machine sews perfectly on both fine and heavy materials.

The horse suffers from many ills, the direct result of his unbecoming and unnecessary haste in eating. Confronted by a generous display of oats in the feed-box, he cannot resist the inclination to bolt one mouthful, so that he may take another at the expense of his health. A style of feed-box has been recently worked out by Samuel Cunningham, chief of the Lockport, N. Y., fire department, by which this unwarranted haste on the part of the animal is checked. In this new invention the feed is delivered to the animal through a cone-shaped device with a hole in the bottom. The horse secures a mouthful of food by pushing his nose into the cone, and the oats are forced up within reach of his mouth through the hole, but the secret of the operation of the invention is that the animal cannot push his nose into the cone until he has disposed of the previous mouthful. In this manner he is compelled to eat his meal in a more deliberate and wholesome manner.

Oil for the purpose of quieting the sea has been in use for many years, but an extremely novel means of applying the oil has been recently devised by Vice-Admiral Guimares of the Brazilian navy, who has made a gun for the special function of doing this work. The gun is called a "bottle gun," and in use occupies a place on deck in the forward part of the boat. In case of a very turbulent sea, the gun is loaded with a bottle containing sawdust which has been soaked with oil. The discharge of the weapon breaks the bottle into innumerable pieces, and the contents are scattered over the surface of the sea for some considerable distance, and the effect on the troubled water is at once noticeable. If this operation is followed at intervals of five minutes, and the missile shot ahead of the boat, a peaceful path is prepared for the craft, and if she is at anchor or lying-to, one round every twenty minutes is said to be ample. The gun is of special construction to meet the demands of the peculiar missile, and it is said that an ordinary wine bottle may be utilized to contain the charge of sawdust.

Almost anyone who thoughtfully contemplates the construction of a baseball cannot but help admire the ingenuity of the man who designed the cover. This consists of two parts, each of which is a complete geometrical design, and when applied to the exterior of the sphere, covers the same in a very thorough manner. The man who originally worked this design out died a few weeks ago. He was Elias Drake, and he lived at Middleboro, Mass., and during his lifetime he invented a number of other useful devices, and enjoyed the reputation of a rather prolific inventor. He thought out the idea of the baseball cover in 1855, and it was adopted two years later by George and Harry Wright and has been in use ever since. Mr. Drake neglected to take out a patent on this cover, for the reason that he thought it too trivial; but when the game became more popular, and the business of making the balls developed into a big industry, he regretted that he had overlooked the formality of protecting himself.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

ELECTRIC LOCK.—N. W. WEBB, New York, N. Y. The invention relates to electric door-locks connected with an electric alarm at a distant point. The object is to provide a new and improved electric lock arranged to give an alarm when tampered with by unauthorized persons before such persons can open the door sufficiently to effect an entrance into the house.

ELECTRIC BELL-RINGER.—I. W. HALL, Brownwood, Texas. In this case the invention relates to electric bell-ringers, the more particular object being to provide a simple, reliable, and efficient bell-ringer which may be operated either by electric wires from a distance or by merely pressing a push-button.

PROTECTED RAIL.—L. STEINBERGER, New York, N. Y. In the present patent Mr. Steinberger's invention has reference to railways, the more particular object in view in his improvement being the production of a protected rail which may be employed in various relations for supplying current to electric railways.

Of Interest to Farmers.

SEED-PLANTER AND FERTILIZER-DISTRIBUTER.—J. A. BOUCHILLON, Pelzer, S. C. Separate hoppers are employed in this planter and distributer, each being provided with means for agitating its contents and feeding the same to discharge-orifices, the machine being supported upon a bearing-wheel from which the agitators are operated. By the means used the labor of guiding and supporting the machine vertically is reduced to a minimum.

HUSKING-MACHINE.—O. C. MOORE, Morrow, Ohio. Mr. Moore's invention relates to corn-huskers, it being more particularly directed to the feed mechanism for the snapping-rolls. To obviate the many difficulties that occur in operating husking-machines and to provide a mechanism which will allow the applying of the proper pressure to the snapping-rolls and at the same time secure automatic feed is the principal object of the inventor.

DEHORNER FOR CATTLE.—C. E. BINNINGS, Stamford, Texas. This inventor's improvement relates to instruments for dehorning cattle. His improved dehorner admits of general use, but is of special value in removing the embryo of partially-developed horns of exceedingly young cattle. After the removal, it is impossible for a horn to grow out.

Of General Interest.

PORTABLE GARMENT-HANGER.—A. M. TAYLOR, Port Ewen, N. Y. The aim of this inventor is to provide a hanger which is simple and durable in construction, cheap to manufacture, readily set up for use and easily folded for convenient storing in a traveling-bag, valise, and the like, and arranged to conveniently support a number of articles, such as a coat, vest, overcoat, trousers, and hat.

PRICKING-PUNCH.—C. E. TRAXEL, Rome, N. Y. In the present patent the invention has reference to improvements in tools for pricking metal for the starting of drills or the like. The object in view of the inventor being the provision of a tool of this character that will be practically automatic in its operation.

VALVE.—E. F. RIDDLE, Wellsville, Ohio. This automatic gas-cut-off valve acts by gravity to close when the gas supply and pressure is shut off or fails, and when once closed the valve stays closed until opened by hand. The object of the invention is to produce a valve quick and certain in operation, and which will not leak in either open or closed position. When open the valve does not reduce or obstruct the gas passage or pressure, and it is simple in construction and neat in appearance.

CABLE-GRIP.—A. J. NEFF, Houston, Texas. The grip is to be used in connection with cableways. The object of the improvement is to produce a grip of simple construction which will operate to grasp the moving cable firmly and which will operate automatically to apply its grasping force when a load upon the grip is applied.

WATCH-PROTECTOR. — J. MIDDLEBROOK, Barre, Vt. In this instance the invention pertains to improvements in devices designed to be placed in a person's pocket to prevent the accidental or fraudulent removal of a watch, the object being to provide a watch-protector of simple and novel construction that may be detachably secured in a pocket and that will be inexpensive.

WRIST-SUPPORTED BLOTTER.—B. MONIS, New York, N. Y. The inventor's more particular purpose in this case is to adapt the blotter for use upon the wrist of the operator, so that it may be used when desired without materially interfering with the use of the pen. The invention relates to blotters, such as used by bookkeepers and writers of various kinds.

PIPE-BAND FASTENING.—A. W. HIGHT, Ballard, Wash. The aim of the invention is to provide an absolutely secure connection with which the ends of the band may be engaged and tightened to any desired tension. To attain this a "shoe" formed of an integral metal plate with an opening therein, is employed. This plate is bent around a head on one end of the band, forming the shoe in essentially U-shaped-cross-sectional form, and the other end of the band being fitted in the shoe and having a nut thereon engaged with one end of the shoe, so that by tightening up the nut any tension may be exerted on the band.

DRYING AND ROASTING FURNACE.—C. E. BALLOW and E. STEIN, Guanacevi, Durango, Mexico. The invention resides particularly in a peculiar combination of a drying and roasting furnace, so that the two may be collectively operated, producing better results than heretofore. Its peculiar devices agitate the ore as it passes through the furnaces, these devices consisting of the combination of shelves and rollers which thoroughly work the ore and retard its downward movement sufficiently to enable the necessary drying and roasting operations.

UMBRELLA.—J. V. SYBRANDT, Springdale, Col. The invention pertains to umbrellas and similar articles, and is capable of application to canopies, tents, and the like. The chief object of the inventor is to provide means whereby an article of the class mentioned can be made of any desired form without interfering with its capacity of being folded.

Heating and Lighting.

CARBURETED-AIR MACHINE.—F. PICARD, Montreal, Canada. The invention relates to the class of carbureters in which rotating fabric is caused to be immersed in the hydrocarbon liquid such as gasoline. The patentee provides a duplicate arrangement of fabric-supporting devices of special form. A fan delivers the air against both the fabrics. The fan and the fabric supports are rotated by a small hydraulic or other motor, and a special automatic mechanism is provided for controlling the supply of air and the motive fluid through the movements of the gasometer bell.

Household Utilities.

ATTACHMENT FOR BEDSTEADS.—H. E. HENWOOD, New York, N. Y. This improvement refers to attachments for bedsteads, and particularly to those adapted for the raising of invalids from the mattress or other supporting-surface. Its principal object is to provide such an attachment which may be applied to an ordinary bedstead without rendering it necessary to alter the bed structure itself, this application being capable of accomplishment without the use of tools.

CHAIR.—J. B. LAWRENCE, New York, N. Y. In this patent the invention relates to improvements in chairs of that class adapted to be converted into a bed or couch and to be used either as a rocker or fixed chair, the object being to provide a chair of this character that may be easily and quickly adjusted as to its various positions and rigidly held as adjusted.

CLOTHES-CLOSET.—M. L. HENRIOUD, Pueblo, Col. The object of the invention is to provide a closet which is adapted to be set up and attached conveniently to the wall in an apartment or living-room. A specific object is to enable closet-space to be produced in rooms not having closets under such circumstances as may arise when rooms are occupied temporarily as sleeping-rooms. It affords means for increasing the ordinary closet-space of the room when found insufficient.

AWNING.—W. H. BROWN and H. M. BRADBURY, New York, N. Y. The improvement made by these inventors relates to a ventilated awning; and the principal objects thereof are to provide means for permitting a circulation of air, and especially for allowing the air which ordinarily collects near the top of an awning and in the upper part of a room to be discharged through the awning itself.

Machines and Mechanical Devices.

CLAMP FOR PRINTING-FILM FRAMES.—B. DAY, West Hoboken, N. J. Mr. Day's present invention relates to frames of the general type described in his former Patent No. 666,087. It covers a device analogous to a hinge, and suitable for use upon printing-film frames of the kind made by the inventor. The frame is of wood, and the clamp grips the frame detachably. The clamp consists of two parts, movable relatively to each other by means of a cam, so as to press firmly upon opposite edges of the frame. One of these parts has two resting places or contact faces, the other having only one. Pressure upon the frame is therefore applied at three separate points, thus insuring exactness in fit. All of the contact faces are milled with ribs parallel with the grain of the wood.

CHANGE-MACHINE.—T. I. POTTER, San Francisco, Cal. The purpose of this invention is to provide a machine adapted to any cash-drawer and from which change may be quickly and accurately made in predetermined amounts by simply pressing one or more of a series of keys, each designating a certain amount, and to provide a series of storage-chambers for the coins from which the change is to be made.

MOLDING-MACHINE.—B. F. POTTER, Ashtabula, Ohio. Mr. Potter's invention relates to a molding-machine which is capable of molding articles of many characters and can be used with plastic materials of various kinds. It is especially applicable, however, to the molding of hollow building-blocks of concrete and the like. One of the principal objects of the invention is to generally increase the efficiency without complicating the structure of machines of this character.

DITCHING-MACHINE.—C. P. GABLE, Ruston, La. In this case the improvement is in the nature of a ditching-machine designed to dig new ditches or clean out old ones; and it consists in the novel construction and arrangement of parts of a portable machine designed to take up the dirt and deposit it on one side or the other of the ditch.

DOUGHNUT-MACHINE.—W. W. GRAY and P. C. VAN FLEET, Riverside, Cal. This apparatus forms dough into rings to produce doughnuts. As these are ordinarily cut out from a sheet in the presence of free flour to prevent sticking, the dough between the cut rings is rolled over and again cut, resulting in a product becoming more and more tough as this operation continues. Moreover, the loose flour collects in the frying-fat and soon burns, thickening it so that it must be frequently strained, and often completely spoiled. To obviate such difficulties are the principal objects of the invention.

MIXING-MACHINE.—J. B. CROSS, Oneonta, N. Y. This invention refers to mechanical means for mixing together the ingredients used in the production of bread, cakes, or pastry-dough, and has for its object to provide novel features of construction for the mixing-machine that are very simple and inexpensive, convenient to operate, readily taken apart for cleaning, and are strong and durable.

SAFETY DEVICE FOR ELEVATORS.—C. W. HOFFMAN, New York, N. Y. The object of the invention is to provide a device for elevators arranged to insure quick application of the brake-shoes in case of accident, to prevent the cage from acquiring too much momentum by falling a great distance, and then powerfully apply the brake-shoes to hold the cage in the initial position.

YARN-PRINTING MACHINE. — W. K. HAWK, Falls of Schuylkill, Pa. The object of the invention is to provide a new and improved yarn-printing machine arranged to permit printing yarns of any desired length, and more especially such as are required in the weaving of large rugs known as "art-squares," the arrangement being such that the same printing-drum will answer in printing long or short yarn.

BUTTER CUTTER AND MEASURER.—G. ERICSON, Brooklyn, N. Y. In the present instance the invention of Mr. Ericson has reference to the provision of a novel means for cutting out from a larger mass of butter a print or regularly-formed block of butter and for the simultaneous weighing or measuring of the print or block.

SHINGLE-MACHINE. — A. Z. BODREAUX, Berwick, La. This invention relates particularly to attachments to shingle-sawing machines in which the saw rotates in a horizontal plane, the object being to provide a simple device for ejecting the spalts from the machine instead of manually removing the same, as in the usual practice, thus obviating the possibility of cutting the attendant's hands or fingers by the saw.

Prime Movers and Their Accessories.

TURBINE-ENGINE.—M. D. KALBACH, Lebanon, Pa. The rotary member of the engine consists of a disk formed with two radial rows of vanes projecting from the periphery. Be-

tween the two rows is a stationary annular abutment which separates them. The steam is fed in at the top of the casing against opposite sides of the disk, but acts on only one half of the circumference at a time. In operation the steam first impinges on the vanes, whence it is deflected into ducts in the casing, only to be redirected against the vanes a little farther down, and deflected into lower ducts. Thus the steam threads its way in and out until the exhaust port at the bottom of the casing is reached. The ducts are made successively larger to allow for expansion of the steam. To reverse the engine the steam is conducted against the opposite half circumference of the disk.

INJECTOR.—G. H. BOETCHER, Cambridge, Ohio. This injector comprises a nozzle, a conduit into which the nozzle extends and which is provided with an opening beside the nozzle into the outer air, a casing adapted to contain a body of liquid and having a liquid-discharge opening and an air-discharge opening and into which the conduit extends, and a sleeve surrounding the end of the conduit within the casing and flaring outwardly into close proximity with the casing and being provided with an opening at the side of the conduit end.

CURRENT-MOTOR.—A. A. MORTON, Walla Walla, Wash. The invention refers to improvements in motors operated by steam-currents; the object being to provide a motor simple in construction, having no parts liable to get out of order, and that will be operated by currents of any force and regulated as to the throw of its transmission-rod leading to machinery on shore.

CARBURETER FOR HYDROCARBON-ENGINES.—J. H. JOHNSTON, 145 Rue de la Pompe, Paris, France. This invention pertains to improvements in carbureters for hydrocarbon-engines or motors, and has for its object to provide a carbureter in which the admission of the air for the formation of the explosive mixture shall be automatically regulated according to the extent of aspiration of the engine or motor, and consequently according to the speed of the latter, in such a manner that the richness of the mixture will always remain at the most suitable point for the proper working of the motor.

STEAM-BOILER.—J. P. KARR, Monticello, Ind. Mr. Karr's improvement pertains more particularly to an attachment to steam-boilers, the object being to provide means whereby the boiler capacity may be increased over steam-boilers as heretofore constructed and without corresponding increase of fuel consumption. Broadly stated, it consists of a portable independent section adapted to be placed at the rear end of return-flue boilers or the smoke-box end of direct-draft boilers.

Railways and Their Accessories.

RAILWAY-TIE AND HEATING DEVICE THEREFOR.—C. S. CHAPMAN, Ridgewood, N. J. The invention comprehends a railway-tie possessing in itself certain valuable characteristics, but has reference more especially to means for heating simultaneously any desired number or all the ties of a line or section of railway and incidentally or indirectly the rails supported thereon by which to effect the melting of snow and ice accumulating on the rails during the cold seasons.

CAR.—T. H. PROSKE, Denver, Col. This invention relates to the removal of material loosened by blasting operations carried on in mines, tunnels, and like work. Its object is to provide a car more especially designed for directly receiving the material resulting from the blasting operations and for allowing quick and convenient removal of the material from the breast of the mine or tunnel and to permit dumping of the material outside of the tunnel or mine from either end or side of the car.

Pertaining to Vehicles.

SANDING DEVICE.—A. L. MOSS, Sandusky, Ohio. The object of the inventor is to provide a device, more especially designed for use on automobiles and like vehicles and arranged to permit the chauffeur to throw the device quickly into action to sprinkle the road-bed with sand whenever required with a view to prevent the vehicle-wheels from slipping, especially when the road-bed is wet or otherwise rendered slippery.

SPRING-BOLSTER.—W. J. FOISTER, Myrtle-point, Ore. Provision is made in this case for novel details of construction for the bolsters employed whereby springs are associated with the bolsters and adapted for absorbing shocks sustained by the loaded wagon in moving over a rough road-bed. The invention relates to springs employed for cushioning the impact of a load on a vehicle, such as a freight-hauling wagon.

Designs.

DESIGN FOR A COLOR-EXHIBITING STAND.—W. H. REESE, Milwaukee, Wis. The designer's claim is for an ornamental design consisting of a color-exhibiting stand. The invention comprises an upright frame on two posts connected by cross pieces in which pivotally turns revolving portion containing two rows of places for the exposition of materials of different colors.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 7459.—Wanted, importers of gum amber and copalite.

For mining engines. J. S. Mundy, Newark, N. J.

Inquiry No. 7460.—Wanted, a metallic or mineral powder of the color of silver or aluminium.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 7461.—Wanted, machinery to manufacture an article similar to a round nail or pin.

Drying Machinery and Presses. Biles, Louisville, Ky.

Inquiry No. 7462.—For makers of or dealers in spray pump nozzles.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 7463.—For makers of slot machines for selling cigars.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 7464.—Wanted, makers of a roaster for coffee and peanuts.

WANTED.—Patented specialties of merit, to manufacture and market. Power Specialty Co., Detroit, Mich.

Inquiry No. 7465.—Wanted, German-made paper, litho or oliograph front picture frames for cabinets.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 7466.—For makers of a practical milking machine.

WANTED.—Ideas regarding patentable device for water well paste or mucilage bottle. Address Adhesive, P. O. Box 773, New York.

Inquiry No. 7467.—Wanted, for shipment to Bombay, kerosene, paraffine and other heavy oils for motors.

LATEST ADVERTISING NOVELTIES.—High-grade Illustrating, Designing and Printing. Catalogues a Specialty. Smith & Berkley, Holland Bldg., St. Louis, Mo.

Inquiry No. 7468.—For makers of street railway supplies.

FOR SALE.—Six horse-power kerosene engine, Mietz & Weiss make. No dealers. For price and particulars address Geo. F. Lufbery, Jr., P. O. Box 174, Elizabeth, N. J.

Inquiry No. 7469.—For dealers in sand, such as used in hour glasses.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery tools and wood fibre products. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

Inquiry No. 7470.—For makers of embossing machines for name plates.

FOR SALE.—A small manufacturing plant in operation, well equipped for manufacturing wrought specialties. Reason for selling, other interests. Address Box 1163, Hartford, Conn.

Inquiry No. 7471.—For dealers in ornamental and plain iron, brass and copper and supplies used in making bent iron articles.

Absolute privacy for inventors and experimenting. A well-equipped private laboratory can be rented on moderate terms from the Electrical Testing Laboratories, 548 East 80th St., New York. Write to-day.

Inquiry No. 7472.—Wanted, addresses of makers of large alarm clocks with dial from 8 to 12 inches or more.

INVENTIONS WANTED.—Undersigned will consider one or two good patented or patentable inventions to manufacture on royalty. Something in popular demand preferred. Honest treatment guaranteed. F. Raniville Company, Grand Rapids, Mich.

Inquiry No. 7473.—For makers of aerial wheels or propellers.

Inquiry No. 7474.—Wanted, a machine which will wire and seal wooden boxes mechanically and automatically; boxes are 8 inches by 8 by 12½ inches.

Inquiry No. 7475.—Wanted, an electric machine for welding cotton ties.

Inquiry No. 7476.—Wanted, a plan for a 16-foot torpedo stern power boat.

Inquiry No. 7477.—Wanted, powdered metal called "thermit."

Inquiry No. 7478.—For manufacturers of up-to-date machinery and apparatus for a canning factory.

Inquiry No. 7479.—For manufacturers of safety matches, i. e., those which have a specially prepared igniting surface.

Inquiry No. 7480.—Wanted, case-hardened steel or other metal cylinders, 20, 30 and 40 inches long, 10¼ or 10 3-16 inches outside diameter, surface to be perfectly true and smooth longitudinally and circumferentially; walls ¼ inch thick, or less.

Inquiry No. 7481.—For manufacturers of machines and appliances for a quarry.

Inquiry No. 7482.—For manufacturers of electrical process for smelting iron.

Inquiry No. 7483.—For manufacturers of small combination locks.

Inquiry No. 7484.—For parties making or selling ⅛ or 3-16 inch flexible wire rope.

Inquiry No. 7485.—For manufacturers of marine gasoline engine of about 1½ h. p., and 1 who would be willing to sell the necessary castings and working drawings.

Inquiry No. 7486.—For manufacturers of pickering-drawing machines.

Inquiry No. 7487.—For dealers in aluminum and makers of aluminum goods.

Inquiry No. 7488.—For manufacturers of wireless telegraph apparatus.

Inquiry No. 7489.—For manufacturers of celluloid in sheets.

Inquiry No. 7490.—For manufacturers of machines for digging ditches for tile drains.

Inquiry No. 7491.—For manufacturers of "Ransom Mixer" for concrete work; also "White's Improved Road Oiler" for hot or cold oil.

Inquiry No. 7492.—For manufacturers of hand circular saws.

Inquiry No. 7493.—For manufacturers of thin woods and veneers for scroll work; also imported hard woods.

Inquiry No. 7494.—For manufacturers of machines for making pins, needles, pencils, nails, hinges, screws, etc.

Inquiry No. 7495.—For manufacturers of non-reusable bottles.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(9835) C. J. H. asks: Please answer through your Notes and Queries the following: How many watts will ten sixteen-candle-power electric lamps consume in one hour? A. Ten 16-candle lamps consume about 550 watts. Now watts have no dependence upon time. In one hour these lamps will consume 550 watt-hours. A watt-hour is one watt exerted for one hour, and is the basis for rating electric current in making bill for its service.

(9836) P. asks: When did the words "In God We Trust," appear on our coins? A. The phrase "In God We Trust" was first used on the half-eagle or five-dollar gold piece in 1866. In 1878 it appeared on the silver trade dollar piece. In 1876 it appeared on the silver half-dollar, and on the silver quarter-dollar and the nickel five-cent pieces of 1876. The two-cent bronze piece of 1864 had it. It appeared on the coinage by authority of Congress.

(9837) C. H. W. asks: 1. If an electro-magnet will lift ten times its weight, what will be the result if it is mounted on about the center of a four-wheeled vehicle that does not weigh any more than the magnet, and just behind the magnet is mounted a flat piece of the same kind of iron, which weighs just as much as that used in the magnet, and is so fixed that it can be made to all but touch the magnet? Now we have ten times the weight of the magnet less the weight of the vehicle, the iron plate, and the loss of magnetism in the air space. Will the magnet pull the vehicle or will it not? A. From your description of the arrangement of a magnet, a vehicle and a piece of iron we are not able to see why there should be any motion produced. A magnet rests on a vehicle and near it in the same vehicle is a piece of iron. Why should the vehicle move? There seems something lacking in the description, and we can only suggest that you try your own arrangement and see what results. 2. In nickel-plating small articles of brass by electroplating, about how long is it necessary for them to hang in the solution? A. A coating of nickel can gain a thickness sufficient to cover in three or four minutes. To deposit a thick coat will require much longer.

(9838) X. asks: Could you let me know through your paper if electricity can be taken out of the human body, and if so by what means; also if it can be put in the body, and how? A. If the meaning of your inquiry is, "Can all the electricity be taken out of the human body?" we answer: No. Electricity can be put into the human body in the sense in which you seem to use the expression by placing the person upon an insulated platform and connecting him to a source of electricity. He will be electrified to the potential of the current he is connected with.

(9839) E. B. C. asks: 1. Will you kindly tell me how much and what kind of wire (size and covering) will be suitable for winding a magnet on a soft iron core 8½ inches long, for use with Edison 110 or 115-volt contact current? A. We do not know what you wish to do with an electro-magnet, and it is not possible to give very good advice upon winding an unknown quantity. Still we may say that you should not wind the magnet with wire enough to put it directly upon a 110-volt circuit. The amount of wire required is too great. Five pounds of No. 24 single cotton-covered copper magnet wire will allow one ampere to flow; so also will 12 pounds of No. 22. These quantities seem to us quite out of the question. The heating in the interior of such a winding must soon char the insulation and injure the magnet. It is far better to wind six layers of No. 14 copper magnet wire on your core, and then use the magnet with an external resistance, a rheostat, which need not cost much, and can be bought from dealers in lanterns. The wire will carry a good current to magnetize the core, and the rheostat will dissipate the larger part of the heat from the larger current used. 2. Is there any device for recording the keys or notes struck by a piano player? A. An attachment has been used for recording the notes struck on a musical instrument, such as an organ or piano. We do not know whether it is in existence now or not. It did not seem to attract musicians to any great extent.

NEW BOOKS, ETC.

CEMENTS, LIMES, AND PLASTERS. By Edwin C. Eckel, C.E. New York: John Wiley & Sons, 1905. 8vo.; pp. 710. Price, $6.

This work is a very complete summary of the composition and character of raw materials, method of manufacture, and properties of the various cementing materials used for building and engineering to-day. It is divided into seven parts as follows: Plasters; Limes; Magnesia and Oxychloride Cements; Hydraulic Limes, Selenitic Limes, and Grappier Cements; Natural Cements; Portland Cement; and Puzzolan Cements. The book is illustrated with no less with 165 figures, diagrams, and half-tones. There are several maps of the United States, showing the locations of natural and Portland cement plants, gypsum mills, etc. The book contains 254 tables, giving all possible information regarding the various cements, both natural and artificial, and also regarding cement machinery, and the cost of operating the same. The book is exceedingly comprehensive in character, and will be found valuable by all engineers.

HANDBOOK OF LITHOGRAPHY. By David Cumming. New York: The Macmillan Company, 1905. 12mo.; pp. 243. Price, $2.

This book is a practical treatise for all who are interested in the process of lithography. Lithographic stones—their properties, defects, and preparation; transfer inks and papers, and the various kinds of transfers, as well as arranging and patching up work for transferring; drawing on stone for black and color work, and transferring work to the stone; the preparation of stones for printing; hand-press and machine printing; the principles of chromo-lithographic drawing and printing; and paper of various kinds, qualities, and printing conditions, are some of the subjects discussed. The book has a number of colored plates, showing the different tints used in ordinary lithography. It is a very complete and interesting handbook, and a book which will be found useful to all lithographers.

TRAZIONE A VAPORE SULLE FERROVIE ORDINARIE. By G. Ottone. Milan: Ulrico Hoepli, 1905. 32mo.; pp. 469.

MANUALE DELL' INGEGNERE ELETTRICISTA. By Attilio Marro. Milan: Ulrico Hoepli, 1905. 32mo.; pp. 689.

LE ABITAZIONI POPOLARI. By Effren Magrini. Milan: Ulrico Hoepli, 1905. 32mo.; pp. 309.

RESISTENZA DEI MATERIALI E STABILITA DELLE CONSTRUZIONI. Dr. Guido Sandrinelli. Milan: Ulrico Hoepli, 1905. 32mo.; pp. 471.

INDEX OF INVENTIONS

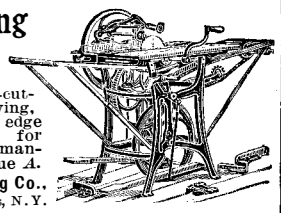
For which Letters Patent of the United States were Issued for the Week Ending October 31, 1905

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Accumulator, R. W. Wilson	803,383
Acid, etc., making oxalic, F. A. Feldkamp	802,980
Adjustable stroke mechanism, parallel, E. S. Clark	803,149
Advertising device, M. S. Alexander	803,084
Advertising device, G. G. Allen	803,386
Amalgamator, H. J. Horstmann	802,987
Amusement device, W. H. Logan	803,119
Amusement device, S. Koppel	803,171
Amusement device, W. F. Bernheisel	803,465
Annunciator, C. W. Lebeis	803,348
Armature coils, apparatus for short circuiting turns in, J. F. Shoemaker	803,442
Atomizer or nebulizer, O. C. Knight	803,170
Auger, expansion, T. F. Gaynor	803,223
Automobile rear axle, F. C. Miller	803,121
Ax rack and locker, C. A. Swanson	803,255
Axle, R. Mulholland	803,012
Axle box lid, car, W. G. Dunham	803,155
Baby jumper, E. M. Monroe	803,427
Baggage, S. Christie	803,094
Bale tie machine, J. W. Miller	803,499
Baling press, S. P. Northcutt	803,126
Band saws, machine for setting, J. C. Reckweg	803,432
Bank, combination coin, F. Smith	803,249
Bank or other box, G. R. Hill	803,059
Bearing, elastic collar, D. W. Jordan	803,235
Bearing, gravity roller side, J. F. O'Connor	803,241
Bed spring, J. Janes	803,419
Bed spring tightener, G. S. Willett	803,144
Beds, appliance for surgical, E. H. Richards	803,193
Bedstead, A. H. Davis	803,049
Belt splicing implement, J. & P. B. Landgraf	803,492
Bicycles, wheels, and the like, stand for holding, A. Shearman	803,196
Billiard cue tip, F. E. Joselin	802,990
Billiard cue tip holder, H. J. Koegel	803,420
Bin, J. Minchin	803,184
Bit. See Center bit.	
Blotters, etc., support for, A. Webster	803,039
Boat, J. F. Conkling	803,272
Book and paper holder, D. Weaver	803,083
Book, memorandum, order, diary, account, sample, or similar, E. M. Goldsmith	803,480
Books, pamphlets, pads, etc., applying strips to, J. Hren	803,488
Boot cleaner, R. T. Cummings	803,471
Bore sight, G. N. Saegmuller	803,435
Boring tool, C. Smith	803,368
Bottle closure, E. C. Fowke	803,334
Bottle corking machine, J. B. Davis	803,329
Bottle washing machine, F. N. Young	803,043
Box fastener, L. M. Gilchrist	803,101
Brake beam and making the same, J. F. Streib	803,313
Brake shoe holder, E. Wilson	803,205
Bread to crumbs, appliance for reducing, E. F. B. Kenyon	803,061
Brooder, W. A. Sumner	803,140
Bucket, clam shell, J. Lindstrom	803,118
Building block, J. Wickre	803,280
Building block and wall construction, O. Johnson	803,290

Wood-working Machinery



For ripping, cross-cutting, mitering, grooving, boring, scroll-sawing edge moulding, mortising; for working wood in any manner. Send for catalogue *A*.

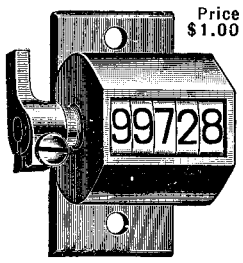
The Seneca Falls M'f'g Co.,
695 Water St., Seneca Falls, N.Y.

Engine and Foot Lathes

MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE

SEBASTIAN LATHE CO., 120 Culvert St, Cincinnati, O.

Veeder Counters



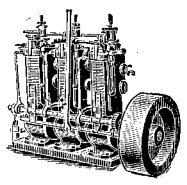
Price $1.00

to register reciprocating movements or revolutions. Cut full size.

Booklet Free

VEEDER MFG. CO.
Hartford, Conn.

Cyclometers, Odometers, Tachometers, Counters and Fine Castings.



WOLVERINE
SELF STARTING AND REVERSING
Gasoline Marine Engines

3 to 18 horse power. Launches 18 to 75 ft. Write for catalogue.

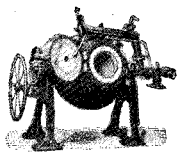
WOLVERINE MOTOR WORKS
Grand Rapids, Mich., U. S. A.
Brooklyn office, 97 22d St.

PATENTS

Our Hand Book on Patents, Trade-Marks, etc., sent free. Patents procured through Munn & Co., receive free notice in the

SCIENTIFIC AMERICAN

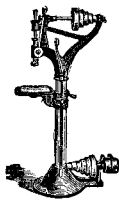
MUNN & CO., 361 Broadway, N. Y.
BRANCH OFFICE: 625 F St., Washington, D. C.



Schwartz Furnace
FOR MELTING GRAY IRON, STEEL, COPPER, BRASS AND BRONZE

Send for Catalogue

HAWLEY DOWN DRAFT FURNACE CO.
NEW YORK, N. Y. CHICAGO, ILL.

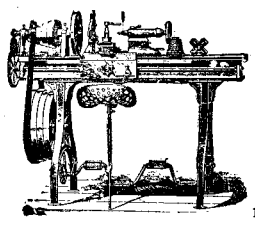


THE B. F. BARNES 14-INCH DRILL

is adapted for work from 1-16 inch to ¾ inch. A strong, substantial, well built drill. Plain lever or power feed as desired. We build a full line of Drills. All sizes furnished in Gangs Also have 9-inch, and 11-inch Screw Cutting Lathes, and a 24x2-inch Wet Tool Grinder. Catalog S on request.

B. F. BARNES COMPANY, Rockford, Ill.
European Branch, 149 Queen Victoria St., London, E.C.

ELECTRO MOTOR, SIMPLE, HOW TO make.—By G. M. Hopkins. Description of a small electric motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **644**. Price 10 cents. To be had at this office and from all newsdealers.



FOR
GUNSMITHS, TOOL MAKERS, EXPERIMENTAL & REPAIR WORK, ETC.

From 9-in. to 13-in. swing. Arranged for Steam or Foot Power, Velocipede or Stand-up Treadle.
Send for Lathe Catalog.

W. F. & JNO. BARNES CO.
Established 1872.
1999 Ruby St., ROCKFORD, ILL.

A GOOD INVESTMENT

For **$1.75** we will send by express (not prepaid), complete N. D. Outfit with full instructions for learning

TELEGRAPH OPERATING.

A fascinating study that will enable you to earn good wages.

Send for our catalog.
Established 1879.

J. H. BUNNELL & CO., Inc. 20 Park Place New York

How To Increase Your Business

READ carefully, every week, the **Business and Personal Wants** column in the

Scientific American

This week it will be found on page 386.

Some week you will be likely to find an inquiry for something that you manufacture or deal in. A prompt reply may bring an order.

Watch it Carefully

Building purposes, hanger for, C. H. Bigelow, Jr.	803,089
Bumping post, J. M. Scott	803,021
Bunsen burner, A. Rector	803,433
Cabinet, delivery, F. J. Dole	803,217
Calorific kiln, E. A. King	803,236
Cane, camp stool, and umbrella, combined, M. H. McNamara	803,187
Capsules, machine for removing and putting on the tops of, B. T. Winchester	803,145
Car brake, W. Balke	803,264
Car construction, J. F. Streib	803,312
Car coupling, G. W. Power	803,069
Car coupling, G. C. Harlin	803,228
Car frame, E. I. Dodds	803,330, 803,331
Car grain door, L. Casteel	802,973
Car part, E. I. Dodds	803,333
Car stike, J. E. Flynn	803,280
Car wheels, making, C. T. Schoen	803,071
Cars, flush drop door for, C. A. Lindstrom	803,117
Cars, sill for metal, E. I. Dodds	803,332
Cart, jogging, M. Baker	802,961
Cartridge belt, woven, W. C. Fisher	803,221
Casing spear, J. Stegner	803,450
Caster, furnace, W. Seavill	803,366
Caster retainer, D. A. Maccuaig	803,001
Cement, etc., furnace for burning, G. Grondal	803,530
Cement receptacles, mold for forming, O. Staley	803,023
Center bit, G. Burki	803,968
Chain link coiling machine, J. Raffloer	803,132
Chair foot rest, W. L. Hoffman	803,341
Chair iron, H. W. Bolens	802,963
Check protector, J. H. Miller	803,298
Checkrein holder, E. Pyle	803,307
Chimney cowl, B. A. Warlick	803,257
Chimneys, safety device for headlight, Barnum & Hallaway	803,323
Churn, W. A. Carpenter	802,972
Churn and butter worker, combined, T. L. Valerius	803,035
Chute, coal, C. W. Hunt	803,288
Circuit breaker counter, E. M. Hewlett	803,340
Cistern, E. & C. Laenger	802,997
Clamp. See Dentist's cervical clamp.	
Class register, J. S. Price	803,360
Clip, C. A. Hermann	803,229
Clothes line reel, G. F. Keating	803,105
Clutch mechanism, wheel and axle, J. R. Steitz	803,024
Coal screen, H. Duggan	803,156
Coal washing apparatus, R. Dick	803,407
Coaster hub for cycles, two-speed, R. W. Smith	803,250
Cock handle, stop, Inches & Hosker	803,168
Coffee drier, D. Gordon	803,055
Coin delivering machine, E. G. Johanson	803,234
Coin holder, T. C. Butler	803,395
Collar button and necktie holder, J. C. Baker	803,461
Collar, horse, J. S. Hull	803,344
Combination lock, J. E. Lemyre	803,064
Composing stick, R. D. Tittle	803,081
Communion cup, sanitary, O. V. L. Harbour	803,416
Condenser, gas, J. S. De Hart, Jr.	803,154
Condenser, surface, F. S. Farnsworth	803,220
Conductors, suspension device for trolley, Davis & Varney	803,216
Confectionery machine, J. C. Palmer	803,017
Confectionery, machine for making, P. Knorpp	803,293
Connector for electric conductors, terminal, J. H. & A. T. Kliegl	802,994
Control regulator, remote, Hall & Yates	803,414
Control system, electric, H. D. James	803,233
Controller, J. P. Durkin, reissue	12,394
Conveyer, T. Cox	803,402
Cooking utensil receptacle, Sturdevant & Sidesinger	803,314
Cooling jackets of steam and indicating the circulation of water therethrough, means for relieving, J. E. Miller	803,354
Cotter pins, machine for making, F. D. Coppage	803,525
Crate, collapsible, A. Johnson	802,988
Crate, shipping, I. Stripe	803,200
Crops, apparatus for growing, Priaulx & Maurice	803,306
Cultivator, T. H. Cope	803,401
Cultivator and planter, combined, H. T. Monson	803,503
Curb, F. B. Berrien	803,390
Current motor control, alternating, C. E. Barry	803,462
Current system of control, alternating, F. Conrad	803,213
Currycomb, M. Alston	803,321
Curtain pole socket, J. Kroder	803,347
Cutter head, Ward & Williams	803,037
Delineating character or disposition of any individual according to the character of the hand, apparatus for, H. N. Marvin	803,002
Dental applicator, J. W. Dennis	803,474, 803,475
Dental instrument, A. P. Johnstone	802,989
Dentist's cervical clamp, L. H. Babcock	803,045
Dip net and fishing rod case, combined, E. K. Brennaaun	803,325
Dish washing apparatus, N. G. De Laney	803,097
Dish washing machine, W. I. McCausland	803,305
Disk drill, W. J. Browne	803,047
Display cabinet, G. F. Conley	803,400
Display rack, J. N. Deaver	803,274
Display stand for headwear, O. Pfleger	803,067
Distilling apparatus, Pogoiavlensky & Kroupovess	803,394
Docket, Wendler & Lindner	803,143
Domestic boiler, E. M. Mouser	803,301
Door hanger, C. W. Tonkinson	803,033
Door securer and burglar alarm, T. M. Enyeart	803,411
Dovetail cutter, J. Laskowitz	803,295
Draft and buffing rigging, R. D. Gallagher, Jr.	803,413
Draft regulator, automatic, A. J. Kaminsky	803,291
Drawer case, tilting, C. G. Schmidt	803,070
Drenching bit, J. Hineman	803,418
Dressing, clavicle, J. W. Hingston	803,286
Drum cord brace, D. M. Wright	803,384
Drying material from which oil has been extracted, Edson & Silliman	803,051
Dust collector, C. Clark	802,974
Dust pan, J. A. Widmer	803,204
Dyeing, C. F. Kubler	803,421
Dynamos, belt casing for axle driven, R. M. Newbold	803,240
Eaves trough and drain pipe, S. Vogel	803,316
Eaves trough supporting bracket, H. K. Flowers	803,477
Electric car controller, F. A. & F. J. Roche	803,020
Electric circuit, long distance, M. S. Lewis	803,493
Electric circuit switch, Conrad & Reynders	803,212
Electric conductors, bonding, H. P. Brown	803,967
Electric current transmission, I. Kitsee, 803,107,	803,110
Electric elevators, control of, G. A. P. Weymouth	803,378
Electric energy, transmission of intelligence with the aid of, I. Kitsee, 803,109, 803,111,	803,112
Electric furnace, E. Appleby	803,147
Electric motors, control system for, R. E. Bates	803,209
Electric regulator or controller, H. R. Stuart	803,253
Electric switch, J. J. Ruddick	803,136
Electric transmission of intelligence, I. Kitsee	803,108
Electrical discharges, means for producing high potential, O. J. Lodge	803,180
Electrolytic cell, H. S. Anderson	803,263
Electromagnet, A. C. Eastwood	803,410
Electromotive force, regulating alternating current, H. R. Stuart	803,254
Elevator safety device, J. Gummerson	803,283
Elevator safety device, E. L. Mater	803,425
Engine: See Gasolene engine.	
Engine, C. V. Frisk	803,336
Engines, valve actuating mechanism for explosive, L. D. Toliver	803,032
Engines, valve gear and automatic cut-off for steam, H. Dunlap	803,409
Engines, valve gear for steam and other fluid pressure, Howard & Gibbs	803,342
Excavating machine, J. Helm	802,985
Excavator, W. B. Hard	803,227
Extension table, H. Lambert	802,998
Eyeglass connection, G. T. McEneany	803,124
Fabrics, machine for producing plaster holding, Winkler & Bach	803,207
Fastener and seal for boxes, etc., W. Vickery, et al	803,201

Jaeger UNDER WEAR.

If you want an underwear that *wears* better, *feels* better, and *protects* better than any other in the market, you must have **"Jaeger."** *Seven weights to choose from.*

Catalogue explains everything. Free, with samples.

Dr. Jaeger's S. W. S. Co.'s Own Stores
New York: 306 Fifth Ave., 157 B'way. Brooklyn: 504 Fulton St. Boston: 228 Boylston St. Philadelphia: 1510 Chestnut St. Chicago: 82 State St.
Agents in all Principal Cities.

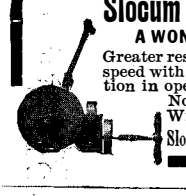
NEW YORK SCHOOL OF AUTOMOBILE ENGINEERS

(INCORPORATED)
146 West 56th Street, New York City
A HIGH GRADE SCHOOL OF INSTRUCTION FOR CHAUFFEURS AND AUTOMOBILE OWNERS

Day and evening classes. Now enrolling students Write, call or phone for particulars. Tel. Columbus 4314

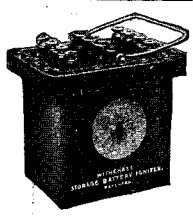
HOW TO MAKE AN ELECTRICAL Furnace for Amateur's Use.—The utilization of 110 volt electric circuits for small furnace work. By N. Monroe Hopkins. This valuable article is accompanied by detailed working drawings on a large scale, and the furnace can be made by any amateur who is versed in the use of tools. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1182**. Price 10 cents. For sale by MUNN & CO., 361 Broadway, New York City, or by any bookseller or newsdealer.

Slocum Hand Power Motor.
A WONDER IN BOAT MOTORS.



Greater results than with oars. Greater speed with less work. Face either direction in operating. Reverses instantly. No skill required. Price $25.00. Write for circular. Patented.

Slocum Hand Power Motor Co., Erie, Pa.



Used by forty of the leading Automobile and motor boat manufacturers. Suitable for any gas or gasoline engine using make and break or jump spark ignition.

EVERY BATTERY GUARANTEED to give satisfaction or purchase money refunded.

WITHERBEE IGNITER CO.
27-31 Thames St. - - NEW YORK

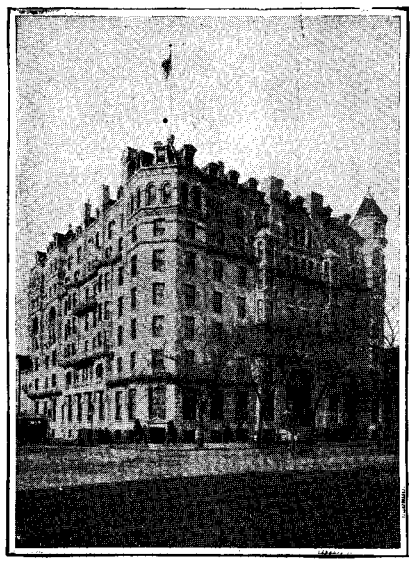
CASH for your REAL ESTATE or BUSINESS

If you want to sell send description and price to

FRANK P. CLEVELAND
Real Estate Expert
1510 Adams Express Building, - - CHICAGO, ILL.

SENSITIVE LABORATORY BALANCE. By N. Monroe Hopkins. This "built-up" laboratory balance will weigh up to one pound and will turn with a quarter of a postage stamp. The balance can be made by any amateur skilled in the use of tools, and it will work as well as a $125 balance. The article is accompanied by detailed working drawings showing various stages of the work. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1184**. Price 10 cents For sale by MUNN & Co., 361 Broadway, New York City, or any bookseller or newsdealer.

THE SHOREHAM,
WASHINGTON, D. C.



JOHN T. DEVINE, PROP.

Fastener for carriage curtains, etc., F. S. Carr	803,468
Faucet, Cilley & Collins	803,469
Feed box, J. J. Danner	802,976
Feed water heater for boilers, C. D. Heywood	803,533
Feeder and band cutter, Brown & Keeney	803,268
Feeder, time stock, A. J. Yuenger	803,262
Fence, J. E. Tyler	803,373
Fence fastener, wire, W. G. Hartmann	803,103
Fence lock, wire, J. W. Drummond	803,408
Fence machine, wire, D. P. Anthony	803,146
Fencing, device for stretching wire, L. G. Bartlett	803,463
Fermenting apparatus, H. H. Freund	803,478
Fertiliser distributer, W. P. Matthews	803,003
Fertilizer distributer, T. H. Haynor	803,417
Fertilizer distributer and grain drill, combined, J. M. Peerson	803,130
Fertilizers, apparatus for making, A. von Krottnauer	802,996
Fibers, liberating and separating, H. S. Blackmore	803,391
Fibers, liberating, separating, and bleaching, H. S. Blackmore	803,392
Filing case, vertical, B. P. Hazeltine	803,104
Filter, J. Q. Adams, et al	803,517
Filter, C. Heilrath, reissue	12,395
Filter, water, M. N. Lynn	803,238, 803,239
Filtering system, F. A. W. Davis	803,096
Fire and water proofing composition, S. J. Hayde	803,285
Fire hose apparatus, E. Cliff	803,095
Firing a powder charge simultaneously throughout its length, F. I. Du Pont	803,131
Firearms, extractor or ejector mechanism for breech loading, G. Ellstrom	803,277
Fish bait or lure, J. B. Rhodes	803,134
Fishing reel, E. Holzmann	803,165
Flexible coupling, J. B. Meriam	803,006
Flue stopper, H. Dixon	802,977
Flues, device for cleaning, H. E. Parson	803,504
Flush tank apparatus, H. H. McMullen	803,355
Forge, portable, W. F. Wendt	803,203
Fruit can opener, F. Trickey	803,034
Fruit picker, C. B. Hysom	803,167
Fuel, making artificial, A. Engle	803,278
Furnace, D. M. Somers	803,076
Furnace, R. W. Menke	803,183
Fuse block or cut out, H. W. Lawrence	802,999
Game apparatus, C. R. Judge	803,346
Game apparatus, J. W. Arney	803,520
Game board, C. W. Morhous	803,299
Garment fastener, separable, D. J. Schaeffer	803,309
Garment hanger, G. S. Roberts	803,363
Garment supporter, B. F. Orewiler	803,066
Garment supporter, A. W. Mensor, et al	803,535
Gas check, needle, W. S. Stapley	803,449
Gas compressor, F. Wittenmeier	803,260
Gas generator, Sinn & Wagner	803,444
Gas mixer or apparatus for regulating the quality of gas, C. M. & C. E. Kemp	803,490
Gas mixtures, process of and apparatus for producing combustible, C. K. Harding	803,534
Gas purifier, Sinn & Wagner	803,139
Gas purifying apparatus, P. Plantinga	803,068
Gasolene engine, H. E. Thompson	803,078
Gate, H. N. & J. E. Hobart	803,163
Gate, W. F. Sanford	803,436
Gear, reversing, W. J. D. Miller	803,065
Gearing, change speed, J. P. Barnes	803,522
Generator. See Gas generator.	
Go-cart, folding, E. Timmerhoff	803,030
Graphophones and like talking machines, tone softening device for, A. E. Thomas	803,028
Grapple, F. Norman	803,015
Grate, C. E. Ward	803,375
Grinding machine, Muncaster & Fletcher	803,304
Grinding machine, ball, E. G. Hoffmann	803,164
Gun, breech loading, H. D. Bernard	803,389
Hammer, pneumatic, M. H. Green	802,984
Hammock, J. Brayshaw	803,091
Harrow, J. Sonerholm	803,197
Harvester binder knotting mechanism, W. Stoffel	803,311
Harvester reel adjusting mechanism, C. A. Rand	803,248
Harvesting machine, self-propelled, J. Zollinger	803,458
Hay press, B. C. Bradley	803,965
Hide stretching machines, truck for moving or handling, E. L. Post	803,359
High pressure cylinders, means for operating the discharge valves of, W. Prellwitz	803,192
Hinge, O. P. Breithut	802,966
Hinge, M. C. Ryan	803,509
Hinge, seat, C. H. Woodruff	803,261
Hitching strap fastener, D. J. Flannigan	803,054
Hoe, Sparks & Kingsbury	803,447
Hoist, wagon, J. D. Stalter	803,448
Holder for filling carriers or bobbins, temporary, J. A. Perkins	803,191
Hoof pad, Fairweather & Duffield	803,219
Horseshoe cushion, P. Clifford	803,211
Hose carrier, water, J. McKinley	803,185
Hose coupling, C. T. Palmer	803,127, 803,128
Hose nozzle, H. Gibbs	802,982
Hot air register, J. T. Slater	803,073
Humidifier, J. J. Smith	803,022
Igniter, combined pocket and match, A. E. Hollister	803,487
Insect destroyer, L. Tanner	803,371
Insulator, E. P. Morris	803,010
Internal combustion engine regulator, A. N. Hotherell	803,339
Jars, bottles, etc., sealing device for, G. Knutzen	803,114
Journal bearing, J. P. Finley	803,159
Kegs or vessels provided with internal shoulders, forming, E. Moxham	803,123
Knitting machine, C. H. & E. C. Wynne	803,042
Knives, forks, etc., handle for, G. S. Hastings	803,161
Lamp, incandescent gas, A. J. Hofmann	802,986
Lamp socket, electric, C. P. Parnell	803,246
Lamp socket, electric, N. Marshall	803,423
Last thimble, F. E. Benton	803,265
Lathe, automatic, K. Webster	803,202
Lathes, stock handling mechanism for turret, J. G. Oliver	803,243
Level, J. Hodgson	803,287
Leveling and raising device, G. H. Tenpas	803,315
Lever, lifting, P. E. Lund	803,495
Lever, self-locking, Bjorneby & Brager	803,046
Lifter, P. Neddo	803,428
Lime, hydrating, J. Reamey, Jr.	803,506
Linotype machines, trimming knife for, J. Keenan	802,992
Locomotive boilers, apparatus for creating draft through furnaces of, G. Hughes	803,166
Locomotive coal chute, V. Z. Caracristi	803,970
Loom, O. W. Schaum	803,511
Loom shuttle, E. M. Main	803,350
Loom warp stop motion, H. Wyman	803,318
Lubricator, L. B. Mames	803,182
Lubricator, grease, F. Lowry	803,296. 803,297
Magnetically operated switch, G. H. Hill	803,486
Mail bag catcher, White & Thomas	803,379
Mail bag catcher and deliverer, R. C. Ogburn	803,242
Mail box, portable, L. A. Boory	803,266
Mail crane, Mathes & Barber	803,426
Manhole terminals, conduit section for, R. W. Lyle	803,120
Match machine, G. Everson	803,158
Match safe, G. A. Lusk	803,181
Material, apparatus for cooling granular, C. A. Matcham	803,424
Material, mold for plastic, F. F. Cole	803,271
Measurer, marker, and recorder, lumber, C. G. Blades	803,393
Measures of fractions, device for giving linear, E. P. Follett	803,222
Mechanical movement, W. H. Voss	803,455
Metallurgical furnace, H. H. Goodsell	803,337
Metering fluids, R. Threlfall	803,029
Microcoustic or device to assist the hearing, J. R. Gault	803,282
Milking machine, G. Hutchinson	803,060
Milling machine attachment, W. Salmon	803,137
Miner's lamp, G. A. Duncan	802,978
Modeling busts, C. Mayer	803,004
Modeling groups, C. Mayer	803,005
Molding machines, discharging device for crayon, C. F. Held	803,057
Mortising machine, C. J. Stafford	803,369
Motor actuator, D. Bacon	803,322
Mower, lawn, W. Marshall	803,496
Music leaf turner, C. E. Shuler	803,443
Music sheet, W. Crippen	803,153
Musical and like symbols, device for printing, E. Cremers	802,975

O. L. Chase
St. Louis, Mo.

I Am the Paint Man

Let Me Give You 2 Gallons of My Paint As a Test

SUPPOSE you went to a store and the man placed 2 full gallons of paint on the counter and said "Here is some paint I want you to try before you buy. Just spread these 2 gallons on your walls. When you have done so, if the paint is entirely satisfactory, come in and buy the balance of your order. If not, these 2 gallons are a present from me as a test."

You would think it was a mighty fair offer, wouldn't you?

But no paint dealer ever makes this kind of an offer. * * *

I am not keeping a paint store.

I am running a paint factory.

My paint is not sold over the counter.

I sell it direct from my factory to the user fresh.

Let me make you a better and more liberal offer than the above.

Here it is.

Let me ship you an order of paint. I will pay all freight on 6 gallons or more.

You sign no contract, obligation, or send me a penny of money in advance.

When the paint arrives choose any 2 full gallons of the order, spread it on your building—it will cover 600 square feet, 2 coats—then you be the judge as to whether you want to use the balance of the order or not.

If not, return the balance of the paint—I will pay the freight back and the 2 gallons used are yours, free, for the test.

If the paint spreads better—further—and looks better than any paint you ever saw, and you want to use the balance of the order, keep it and pay me at the end of 6 months.

With the paint I send my pen-and-ink signed iron-clad Guarantee that it will last 5 years.

This Guarantee is binding and says "money back at the end of the Guarantee period if the paint is not as represented."

The reason I can make you this liberal offer is because I manufacture and sell paint in a new way.

My pigment, or paint base,—which is white lead, zinc, coloring matter and drier—is ground fresh to order after your order is received, hermetically sealed in cans, dated the day it is packed, and shipped in separate cans from the oil.

My Pure Old Process Linseed Oil is shipped in a twin can.

My paint is ready to use but NOT ready mixed.

There are reasons for my manufacturing and selling this way. Good reasons.

Reasons that permit me to give an 8 Year Guarantee.

Briefly, here they are:

Paint pigment is a mineral,

Pure linseed oil is a vegetable.

When packed together the chemical action of the mineral pigment eats the life out of the oil—that shortens the life of the paint.

Old process linseed oil is scarce on the market.

Oil used in ready mixed paint is usually adulterated.

My oil is pure.

Shipping it separately gives you a chance to prove it.

Ready mixed paint settles—a cement-like substance forms in the bottom of every can. This can never be properly mixed again by hand.

My method of shipping pigment and oil separately, does away with all settling. You can use every drop out of every gallon of my paint on your walls, and you get the full life of the paint on your buildings.

* * *

I want to tell you more about my plan.

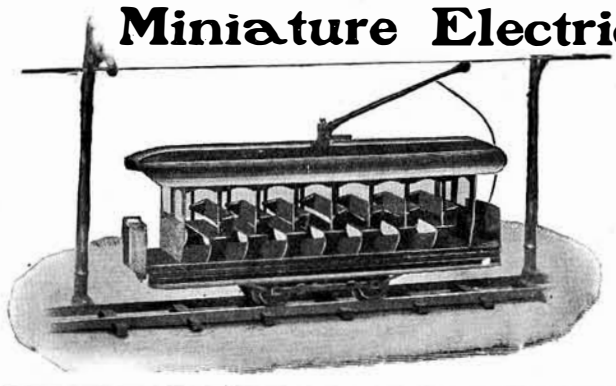
Just drop me a line today, asking for my Paint Book, copy of my Guarantee, and other printed matter, which includes my feee instructions "This Little Book Tells How to Paint." They are all FREE.

Do it now while you think of it.

O. L. CHASE,
The Paint Man.
603 G Locust Street. St. Louis, Mo.

NOTE—My 8 Year Guarantee backed by $50,000 Bond.

Miniature Electric Railroad



WITH TROLLEY CAR, TRACK AND BATTERY

Write for Catalogue "B"

A full line of locomotives and trains, tracks, bridges and switches. Small dynamos and motors.

The Carlisle & Finch Co.
233 East Clifton Avenue
CINCINNATI

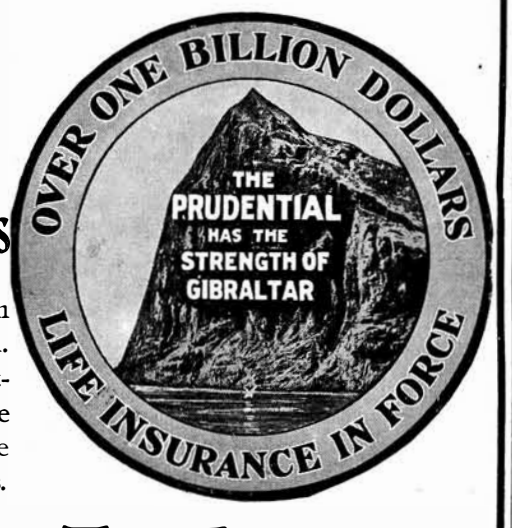
ANDREW CARNEGIE recently said:

"Every young man should get his life insured. The young man who neglects to insure his life, even though it entails some hardship to meet the premiums, does himself and those dependent upon him an injustice."

The Prudential

furnishes an easy method through its

Profitable Endowment Policies



Fill in the attached Coupon and send for full information. It will cost you only a postage stamp and may be the means of starting an ample provision for your later years.

THE PRUDENTIAL

Insurance Company of America

INCORPORATED AS A STOCK COMPANY BY THE STATE OF NEW JERSEY

JOHN F. DRYDEN, President — Home Office: NEWARK, N. J.

Without committing myself to any action, I shall be glad to receive free particulars and rates of Endowment Policies

For $.....

Name.....Age.....

Address .....

Occupation .....Dept. 121

Nail driving machine, H. N. Thume	803,372
Net frame, crab, I. Franklin	803,160
Newspaper rack, De Long & Prevost	803,098
Nut and pipe wrench, combined, M. E. Garwood	803,529
Nut lock, J. T. Smith	803,310
Nut lock, axle, E. S. Morris	803,300
Oil and graphite lubricator, steam heated, J. C. Swoyer	803,370
Oil can attachment, H. J. Klusmire	803,113
Oiling device, automatic, C. Reinker	803,133
Optometer, L. G. Booth	803,267
Ordnance, apparatus for withdrawing smoke and gases from, C. V. Olsop	803,387
Packing and display case, C. H. Fox	803,412
Packing machines and the like, bag spreader for tea, E. S. Peile et al	803,357
Paper, etc., in the manufacture of box slips, machine for folding, W. Boyd	803,964
Paper package and cabinet, toilet, J. T. Hoyt	803,343
Pencil holder and book mark, E. H. Beck	803,464
Penholder, T. C. Strickland	803,077
Photographic flash-light apparatus, Smith & Martin	803,074
Photographic printing frame attachment, F. B. Core	803,328
Piano case brace, M. F. Richardson	803,018
Piano players, adjustable connecting attachment for, R. W. Martin	803,497
Pipe elbows, machine for making, U. D. Alexander	803,320
Pipe, machine for helically corrugating, Isaacs & Speed	803,232
Pipe wrench, E. Huntley	803,231
Pipe wrench and shifting spanner, R. M. Carroll	803,397
Planter, cotton seed, L. E. Waterman	803,082
Plates, roll for scarfing, P. Patterson	803,247
Pliers, P. A. Scott	803,437
Plow, J. Collins	803,327
Plow and cultivator, B. Dalton	803,404
Pneumatic carrier, T. Bemis	803,388
Pneumatic tired wheel, T. B. Jeffery	803,345
Potash, apparatus for extracting crude, Henry & Beale	803,058
Power generator, hydraulic, A. P. Wight	803,317
Printer's galley, J. L. Lee	803,115
Printing and embossing press, W. A. Billman	803,466
Projectile, J. W. Anderson	803,519
Projectiles, soft metal cap for, Tipper & Watson	803,031
Projection apparatus, P. H. Wynne	803,385
Pulley, split, W. R. Patten	803,018
Pump, G. I. Cox	803,048
Pump, H. Cole	803,152
Pump, double-acting plunger, J. Grundel	803,225
Pump mechanism, C. H. Perry	803,358
Quilling machine, G. Adsit	803,459
Quilting frame, L. D. West	803,040
Rack, King & Linsley	803,106
Radiator valve, D. F. Morgan	803,122
Rail joint, G. T. Joseph	802,991
Rail joint, J. Stephens	803,025
Rail joint, E. W. Flinner	803,279
Rail joint, W. W. Post	803,429
Rail sections, clamp for bracing and connecting track, I. N. Spaid	803,446
Rails, support and splice for switch, Snow & Bunn	803,075
Railway, electric, M. C. Rypinski	803,365
Railway frog, J. E. Graham	803,056
Railway or chute, pleasure, W. P. Dameron	803,473
Railway rail brace, H. H. Sponenburg	803,251
Railway signal system, J. C. Mock	803,502
Railway switch, F. L. Young....803,514 to	803,516
Railway track, E. F. Seider.....803,439,	803,440
Railway vehicles and trains, controlling system for, J. L. Crouse	803,214
Railways, automatic emergency air brake operating device for, J. P. Birmingham	803,467
Railways, overhead structure for electric, Davis & Varney	803,215
Ramming machine, Seaver & Ernst	803,438
Reducing or cutting entrails, machine for, J. Cunning	803,526
Reel. See Clothes line reel.	
Refrigerating apparatus, C. C. Palmer	803,189
Relay, electric, I. Kitsee	803,237
Rendering or reducing apparatus, Edson & Silliman	803,050
Rheostat, G. E. Stevens .....803,451 to	803,453
Ring protector, A. Davidoff	803,275
Roll holder and shield, saliva absorbing, R. A. Sprake	803,198
Roofing compound, Parker & Mandile	803,190
Roofing tile and tile roof, L. J. W. Birn	803,524
Rotary engine, J. A. Eaton	803,275
Rotary engine, P. Bartoletti	803,324
Rotary engine, T. Davis	803,406
Rubbing machine, stitch and welt, F. R. Revare	803,507
Rule, folding, C. E. Keefer	803,292
Rule, protractor, C. W. Lines	803,349
Saddle, pack, J. W. Pullman	803,505
Safety gate for dams, Scott & Cundy	803,072
Sash fastener, I. M. Deppen	803,100
Sash holder and lock, F. W. Quitman	803,430
Sash lock, J. Kirby, Jr.	803,169
Sash lock, Mullins & Hare	803,302
Sash lock, I. F. Frisbee	803,335
Saw, cranial, H. C. Masland	803,498
Saw filing device, M. F. Roberts	803,434
Saw jointing and sharpening clamp, H. M. Wood	803,457
Scaffold hanger, M. Cody	803,398
Scale, platform, M. H. Winslow	803,456
Screen, A. M. Scheurle	803,138
Screw cutting die, Smart & Bascom	803,445
Seed extracting machine, G. Emerson	803,157
Sewing machine attachment, P. Robb	803,508
Sewing machine spacing attachment, B. L. Chouteau	803,148
Shade and curtain bracket, double, G. W. Wiggins	803,381
Shafts, lathe attachment for turning crank, D. C. Lewis	803,116
Shear gage, Coggeshall & Holloway	803,151
Shipping box, H. P. Guyton	803,226
Shoe fastener, A. A. Johnson	803,489
Shoe holder for factory racks, W. B. Arnold	803,086
Shoe horn, E. Roraback	803,135
Shoe soles, buffing wheel for refinishing edges of, W. B. Arnold	803,087
Shovel, H. D. Ward	803,142
Shutters, automatic device for closing fireproof, E. C. Washburn	803,038
Signaling apparatus, wireless, L. de Forest	802,981
Sills, construction of metal, R. V. Sage	803,194
Skate runner, T. W. Bryant	803,269
Socket key extension, V. B. Fuller	803,281
Soda fountain cooling case, W. W. Butler	803,969
Spacing device, F. F. Hough	803,230
Spreader, earth and ballast, T. R. McKnight	803,186
Spring lid box, A. M. English	802,979
Spring motor, F. J. Ehrendriech	803,528
Stalk cutter, F. A. Lee	803,063
Steam engine, reversible, J. W. Haron	803,162
Steam pipe collar, J. Hankin	803,481
Steam trap, P. J. Hefferman	803,483
Stereotype and other curved plates, machine for finishing, H. C. MacConnell	803,422
Stone, conveyer for artificial, F. Palmer	803,016
Stone from magnesite, making artificial, M. Gerster	803,479
Stone, machine for making artificial, V. Bueckermann	803,092
Stone, machine for producing artificial, D. McIlravy	803,014
Stopping mechanism, J. G. King	803,062
Stove, regenerative, Hartman & Kennedy	803,284
Stoves, etc., fire chamber for, N. G. Vosler	803,036
Stoves, ironing attachment for, M. W. Cranmer	803,403
Stoves, safety device for gas, R. R. Callan	803,396
Stuffing box drippings, device for collecting, K. Oehlschlaeger	803,188
Swingletree, G. A. Rawhouser	803,431
Switch and signal apparatus and the like, means for supporting, C. Hansel	803,532
Switch operating mechanism, C. G. Colwell	803,399
Switch points, adjusting mechanism for, A. Cellner	803,093
Switch tongue throwing mechanism, J. C. Wilson	803,382
Table. See Extension table.	
Table, I. Mason	803,351
Table and desk, combined, E. Higgins	803,485
Tanks, automatic shut-off valve for flush, W. A. Alexander	803,518

A Catalogue

FOR USERS OF

Machinists' Supplies

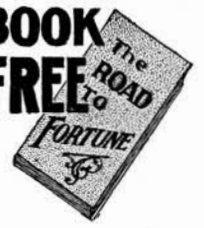
Our new edition, just issued, contains 650 pages, fully illustrated and describing everything in the line of tools, machinery, supplies, etc. For the man interested in the operation of a manufacturing plant, the mechanical departments of a railroad, or any kind of machine shop, this catalogue is a book of positively valuable information. If you are directly interested in machinists' supplies, write for it to-day. Sent free, postpaid. Address

MACHINISTS' SUPPLY CO.

OUR NAME IS A GUARANTEE OF QUALITY

22 SOUTH CANAL ST., CHICAGO, ILL.

INVESTORS BOOK FREE



THIS $1.00 book (bound in boards) sent free for a limited time to any reader of SCIENTIFIC AMERICAN. It tells about the art of money making—how to distinguish between a good and poor investment, how to invest. It might be called a "Guide for Investors." It contains no advertising. To advertise this book, the first edition will be sent absolutely FREE. Address . . .

Barnard System, Dept. 108, 87 Nassau St., New York

BABBITT METALS.—SIX IMPORTANT formulas. SCIENTIFIC AMERICAN SUPPLEMENT 1123. Price 10 cents. For sale by Munn & Co. and all newsdealers. Send for catalogue.

This Book Is Free

It Tells You About a System of Handling Figures With Lightning Rapidity.

One Thousand Copies Will Be Given Away to Those Who Apply First.

THIS BOOK tells about marvelous methods of shortening calculations: methods that simplify the most difficult business problems and sometimes make it possible to do the work of an hour in the space of a minute. It is from the pen of a man who has devoted his life to the subject of rapid and accurate calculations. He is known throughout the United States as the foremost calculator of the day. Every man should calculate quickly and with ease. Every business man must calculate. Often a certain calculation must be made mentally and instantly if you would take care of your own interests. By our improved methods you see results without effort. You multiply, add, subtract and divide fractions or whole numbers with marvelous ease. The methods introduced by this book will revolutionize figuring and arithmetic for you. You can learn at your own home with little effort and without loss of time. If you are an office man the result will be seen in your pay envelope. The man who figures accurately and rapidly can do three times as much work as the one who uses ordinary methods. Unless you know all about figures that you want to know, unless you are accurate in every calculation, you cannot afford to be without this information. It costs you nothing to write for the book; it is free; it may cost you a good position or a valuable promotion to neglect this opportunity. Address Commercial Correspondence Schools, 390 B, Schools Buildings, Rochester, N. Y.

Tappets to stamp stems, means for fixing, Anderson & Jarvis 803,460
Telephony, space, J. S. Stone.....803,199, 803,513
Tire, H. G. Fiske 803,053
Tire, cushion, C. G. & W. J. Shaw..... 803,367
Tire for vehicle wheels, C. Motz..... 803,011
Tire, pneumatic, W. A. Sankey..... 803,510
Tire puller, H. Eichmann 803,276
Tire setter attachment, S. E. Tumalty..... 803,256
Tire tightener, G. P. Alten..... 803,085
Tongs, clamping and lifting, C. W. Zipperer 803,044
Tool, combination, W. Scott, Jr..... 803,512
Torch, gasolene, F. Parizek 803,129
Toy, mechanical, A. Paget 803,244
Track sander, J. H. Watters..... 803,258
Traction engine, R. Reed 803,361
Train order delivery mechanism, J. G. Wilson 803,206
Transmission mechanism, H. Tabor 803,141
Tray, sliding, A. N. Harris..... 803,102
Tree holder, R. A. Risk..... 803,308
Trolley catcher, W. W. Annable..... 803,208
Trolley for electrically propelled vehicles, N. W. Storer 803,252
Trolley retrieving device, H. B. Clarke..... 803,210
Trolley wheel bearing, R. Kissinger..... 802,993
Trousers press, A. E. Happel..... 803,415
Trunk, F. L. Demartini 803,099
Trunks, etc., corner stay for, G. W. Dyarman 803,527
Truss, W. Fielding 803,476
Tubes, machine for producing seamless metallic, G. J. Thust 803,079
Turbines, bucket wheel for elastic fluid, R. H. Rice 803,362
Type holder, H. Schmidt 803,195
Typewriter type bar, C. J. Bellamy..... 803,523
Valve mechanism, Carl & Coulston..... 802,971
Valve mechanism, turbine, J. Wilkinson.... 803,041
Valve, multiple seat, H. Lentz..... 803,000
Vehicle dash, C. R. Patterson..... 803,356
Vehicle, motor, H. P. Moorrees.....803,008, 803,009
Vehicle shaft coupling, R. Mulholland..... 803,013
Vehicle wheel, J. M. Carpenter..... 803,326
Vehicle wheel, W. J. & J. R. Mitchell, 803,500, 803,501
Vehicles, footboard support for motor, H. A. Knox 802,995
Vehicles, throttle and regulating device for explosive motor, T. B. Jeffery..... 803,289
Velocipede, C. G. Krantz 803,294
Vending machine, Davis & Swetland..... 803,405
Vessel, submarine, S. Lake 803,172, 803,173
Vessels, air supply apparatus for submarine, S. Lake 803,176
Vessels, apparatus for constructing containing, E. J. Winslow 803,259
Vessels, ballast apparatus for submarine, S. Lake 803,175
Vessels, ballast device for submarine, S. Lake 803,174
Vessels, engine exhaust for submarine, S. Lake 803,177
Vessels, torpedo handling device for, G. M. Evans 803,218
Wagon brake, C. C. Long..... 803,494
Wagon, dumping, T. J. Cope..... 803,470
Wagon seat, B. F. Lloyd..... 803,179
Wall papering machine, T. H. Butler..... 803,270
Warping machine, W. C. Keyworth..... 803,491
Water bag thermometer attachment, R. Meyer 803,352
Water connections, head for, B. Rubispierre 803,364
Water heater, J. G. Haas..... 803,338
Water heater, filter, and cooler, combined, S. G. Leyson 803,178
Water heater or steam generator, T. Suzuki 803,027
Water wheel, current, J. L. Weaver..... 803,377
Wave motor, W. P. Clinton..... 803,150
Weather strip, F. N. Stubbs..... 803,026
Weed destroying means, C. G. Bradford.... 803,090
Weeder and cultivator, C. I. J. Barker.... 803,088
Weighing machine, automatic, F. F. Wear.. 803,376
Weighing machine combined with automatic sound-producing mechanism, C. S. McIntire 803,125
Wells, apparatus for sinking, Hickox & Killefer 803,484
Welt cutting machine, R. E. Tilton..... 803,080
Wheel. See Pneumatic tired wheel.
Whiffletree coupling, G. L. Miller..... 803,353
Whistle, compressed air, F. Heckler..... 803,482
Window sash lock, W. C. Gilbert..... 802,983
Window sash, metallic, Mullins & Hare.... 803,303
Window screen, adjustable roller, A. J. Baker 803,521
Window shade and curtain bracket, Thomas & Pierce 803,454
Window ventilator, R. M. Goehring..... 803,224
Wire reel, O. H. & F. H. Volkerding..... 803,374
Wire stretcher, H. L. Ferris..... 803,052
Wire stretcher, Shaw & Hutchinson..... 803,441
Wires, plug or connection for electric light line, C. P. Parnell 803,245
Wood, channel furnace for treating, G. Grondal 803,531
Wrench, A. L. Bennett 802,962
Wrench, J. J. A. Miller 803,007
Wrench, F. Zwicker 803,319
Zinc, extraction and purification of, A. V. Cunnington 803,472

DESIGNS.

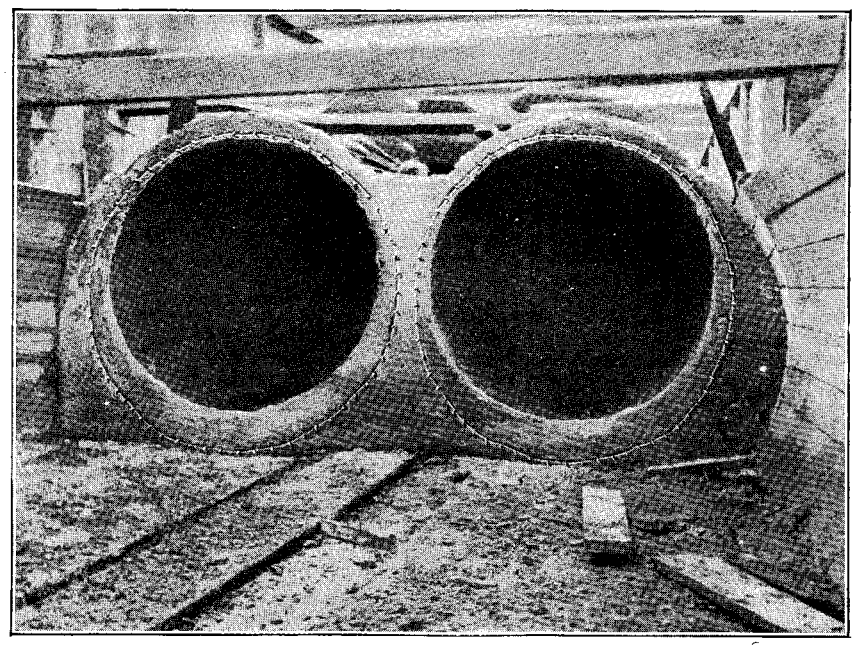
Badge, W. M. Irvine 37,599
Bar fixture, W. C. Huss.....37,609, 37,610
Box, handkerchief, R. Dey 37,602
Chair, A. Karpen 37,606
Clock case, T. B. Stephenson, Jr..... 37,603
Fabric, printed textile, E. B. Vandergaw, 37,634 to 37,638
Fabric, textile, C. F. Richon..... 37,612
Fabric, textile, E. W. Doughty.....37,613, 37,614
Fabric, textile, S. L. Crownfield....37,615 to 37,620
Fabric, textile, H. W. Fowler.....37,621 to 37,626
Fabric, textile, H. P. Johnstone....37,627 to 37,633
Fence, wire, H. Ward 37,611
Glass receptacle, Paull & Grotz..... 37,639
Glass vessel, L. A. Fletcher..... 37,604
Picture frame or base, S. T. Stuver..37,600, 37,601
Stove, F. J. Frey 37,608
Table, S. Gronowski 37,607
Vending machine casing, H. C. Traute..... 37,605

TRADE MARKS.

Alcohol, C. H. Graves & Sons..... 47,226
Antiseptics and germicides, M. W. Savage... 47,282
Axes, Simmons Hardware Co. 47,375
Barley, E. S. Anthony Co..... 47,168
Beans, baked, Joseph Campbell Co..... 47,154
Beer, Bartholomae & Roesing Brewing and Malting Co. 47,315
Beer, Otto Huber Brewery 47,335
Beer, Henning Brewing Co. 47,345
Beer, Hoster-Columbus Associated Breweries Co. 47,346
Beer, bottled lager, Dubuque Brewing and Malting Co. 47,322
Beverages and syrups for the manufacture of such beverages, tonic, Coca Cola Co.. 47,189
Boiler and pipe coverings and non-conducting linings, Chicago Fire Proof Covering Co. 47,356
Boots and shoes, leather, F. Brigham & Gregory Co. 47,147
Boots and shoes, leather, Keiffer Bros..... 47,185
Boots and shoes, leather, L. A. Crossett..... 47,320
Boots and shoes, leather, F. Brigham & Gregory Co. 47,327
Boots and shoes, leather, Regent Shoe Manufacturing Co. 47,370
Boots and shoes, upper leather for, Thayer, Foss & Co. 47,376
Boots, shoes, and slippers and soles therefor, Nathaniel Fisher & Co. 47,223
Bottle corks and prescription corks, Armstrong Cork Co. 47,385
Boxes, paper, Lewis Oppenheimer's Sons.... 47,163
Brandy, National Distilling Co..... 47,161
Brooch, scarf, hat, belt, skirt, stick, lace, cuff, and vest pins and scarf holders and veil clasps, Fishel, Nessler & Co..... 47,182
Brushes, Grand Rapids Brush Co..... 47,183
Butter, Belle Springs Creamery Co..... 47,188
Buttons, collar, Krementz & Co..... 47,365
Candies, Doniphan & Co. 47,218
Candies and candied fruits, D. Arnould..... 47,136
Candy, P. Wunderle 47,305
Canned fish, Francis H. Leggett & Co..... 47,225

Floors

Roofs



Reinforced Concrete Conduits
For the Baltimore Electric Power Company

These conduits supply water to the condenser, taking it from the bay, a distance of 600 feet. They are reinforced with the

Clinton Electrically Welded Fabric

The conduits are buried under 30 feet of clay, and the reinforcement is so placed as to resist this pressure on the under side of the 4-inch crown. Toward the bottom of the conduits the reinforcement is spread outward in order to resist the upward pressure of the water, as the conduits are below the level of the bay.

The System with the Continuous Bond
Send for New Catalog of the Clinton Fire-proofing System

CLINTON WIRE CLOTH COMPANY
CLINTON, MASS.

Ceilings

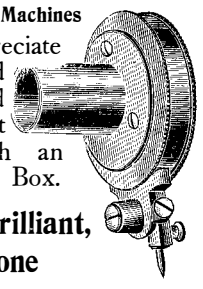
Fire-Proofing Department
ALBERT OLIVER
150 Nassau Street New York

New York, 33 Park Place Boston, Mass.
Chicago, 237 East Lake St. Clinton, Mass.
San Francisco, Cal.

Partitions

H. & S. Sound Box

For Disc Talking Machines



You cannot appreciate what is recorded on a Disc Record until you hear it reproduced with an H. & S. Sound Box.

Clear, Loud, Brilliant, Natural Tone

PRICE $5.00

Made in Three Styles:

No. 100 for Victor Tapering Arm Machines.
No. 200 for Talkaphones, Old Style Disc Graphophones, and all Straight Arm Machines.
No. 300 for Zonophone Tapering Arm Machines.

Apply to your dealer; if he does not keep them order direct.

Order by Number

HAWTHORNE & SHEBLE MFG. CO.
Dept. D, Philadelphia Pa.

BUILD YOUR OWN BOAT

By the Brooks System

If you can drive a nail and cut out a piece of material from a full-sized pattern you can build a canoe, row boat, sail boat or launch in your leisure time—at home—and the building will be a source of profit and pleasure.

All you need is the patterns, costing from $2.50 up, and materials from $5.00 up. The tools are common in every household. Patterns of over forty styles and sizes—all lengths from 12 to 55 feet.

The **Brooks System** consists of **exact size printed paper patterns** of every part of the boat, with **detailed instructions** and **working illustrations** showing each step of the work, an itemized bill of **material required** and how to secure it.

Over six thousand amateurs successfully built boats by the Brooks System last year. Fifty per cent. of them have built their second boat. Many have established themselves in the boat manufacturing business.

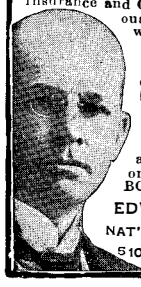
Catalogue and particulars free. For 25 cents 100-page catalogue containing valuable information for the amateur yachtsman, showing several working illustrations of each boat, and a full set for one boat. Full line in knock-down and completed boats. When so ordered, patterns are expressed, charges prepaid C.O.D. to allow examination.

BROOKS BOAT MFG. CO.
Originators of the Pattern System of Boat Building
411 Ship St., Bay City, Mich., U.S.A.

YOU CAN MAKE FROM $300.00 TO $500.00 A MONTH IN THE REAL ESTATE BUSINESS

Send for my FREE BOOK

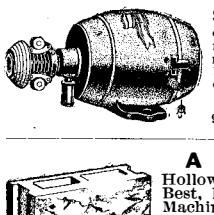
THIS valuable book offers an unusual opportunity for men without capital to become independent for life.
It tells how I have helped hundreds of inexperienced men to immediate and permanent success.
It tells how you can learn the Real Estate, Insurance and General Brokerage Business thoroughly by mail without interfering with your present occupation.



It tells how we appoint you our SPECIAL REPRESENTATIVE, establish you in a pleasant, honorable business of your own, co-operate with and assist you to make a large, steady income.

If you are honest, ambitious and willing to work, write me at once. Just say: "SEND FREE BOOK." Address

EDWIN R. MARDEN, PRES'T
NAT'L CO-OPERATIVE REALTY CO.
510 ATHENAEUM BLDG., CHICAGO

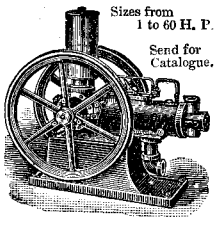


Send the Name of Your Car or engine, and we will send full information about the **Apple Automatic Sparker.** The best storage battery charger for automobile, launch or gas engine. Address,

The Dayton Electrical Mfg. Co.
98 Beaver Bldg. Dayton, Ohio.

A MONEY MAKER
Hollow Concrete Building Blocks. Best, Fastest, Simplest, Cheapest Machine. Fully guaranteed.
THE PETTYJOHN CO.
615 N. 6th Street, Terre Haute, Ind.

THE MIETZ & WEISS OIL ENGINES



Sizes from 1 to 60 H. P.
Send for Catalogue.

Operated by Kerosene Oil, Fuel Oil, Distillate, Safest, Simplest, Most Economical and Most Reliable Power on the market.
Highest award for Direct Coupled Oil Engines and Generator, Paris Exposition, 1900. Gold Medals, Pan American Exposition, 1901, Charleston Exposition. 1902. Gold Medal and Special Diploma, Louisiana Purchase Exposition, St. Louis, Mo., 1904.

AUGUST MIETZ
128-138 Mott St., New York, U.S.A
Catalogue Dept. 24.

None genuine without This Label.

LE PAGE'S GLUE STRONGEST IN THE WORLD
Does not set quickly like the old style glue, and has four times the strength (Official test, 1 in. sq. hard pine butted, registered 1620 lbs. before parting). Used by the best mechanics and mfrs. the world over. Invaluable in household use, for Furniture, China, Ivory, Books, Leather, and wherever a strong adhesive is desired. 1 oz. bottle or collapsible self-sealing tube (retails 10c.) mailed for 12c. if your dealer hasn't our line.

LE PAGE'S PHOTO PASTE,
2 oz. size retails 5c.; by mail, 10c.
LE PAGE'S MUCILAGE,
2 oz. size retails 5c.; by mail, 10c.
RUSSIA CEMENT CO., 139 Essex Ave., Gloucester, Mass.

Will Earn For You $100 A DAY

It will spin sugar into cotton candy, any color or flavor. A child can operate it.

Cotton Candy Machine Co.
58 West 8th Street,
New York, U. S. A.

Our agents as follows: SOUTH AMERICA.—*Argentine*, Goldkuhl & Brostrom, Buenos Aires. *Brazil*, Hopkins, Causer & Hopkins, Birmingham, Eng. *Peru*, T. W. & J. Walker, Wolverhampton, Eng. *Rio Grande do Sul*, E. Berta & Co., Porto Alegre. *Uruguay*, Eugenio Barth & Co., Montevideo. EUROPE.—General Offices: Aktiebolaget Separator, Stockholm. *Germany*, Alfa-Laval Separator, G.m.b.H., Berlin. *Russia*, Ludwig Nobel, St. Petersburg. *Great Britain*, Dairy Supply Co., Ltd., London W. C. *Austria*, Actiengesellschaft-Alfa-Separator, Vienna, XVI. *Denmark*, Alfa-Laval Separator Co., Copenhagen. *Holland*, Boeke & Huidekoper, Groningen. *France*, Th. Pilter, Paris. *Hungary and Balkan States*, Alfa-Separator, R. T., Budapest. *Iceland*, Alfa-Laval Separator Co., Copenhagen. *Spain*, Garteiz Hermanos, Bilbao. *Italy*, Melchior Sordi, Lodi. *Norway* (Power), E. C. Due, Christiania. *Switzerland*, Baumgartner & Baechler, Zurich. *Portugal*, Henrique von Hafe, Oporto. *Belgium*, P. Gillain, Antwerp. *Norway* (Hand), F. Anker, Christiania. *Ireland*, Dairy Supply Co., Ltd., Belfast and Cork. *Luxemburg*, Emile Flammant, Luxemburg. *Finland*, P. Sidorov & Co., Helsingfors. ASIA.—*Siberia*, Ludwig Nobel, St Petersburg. *India, China and Japan*, Dairy Supply Co., Ltd., London. *Persia*, Walker, Gilchrist & Co., Glasgow *Malay Peninsula*, W. V. V. Lidgerwood, London. AFRICA.—*Algiers*, Th. Pilter, Paris. *South Africa*, Farrar, Robinson & Co., Ltd., Port Elizabeth. *Egypt*, Dairy Supply Co., Ltd., London. AUSTRALASIA.—*New Zealand*, Mason, Struthers & Co., Christchurch. *New South Wales and Queensland*, Waugh & Josephson, Sydney. *South Australia*, A. W. Sandford & Co., Adelaide. *West Australia and Victoria*. J. Bartram & Son, Melbourne. PACIFIC OCEAN ISLANDS.—*Hawaiian, Samoan, Philippines, etc.*, De Laval Dairy Supply Co., San Francisco.

Whitewash Your Factory at Lowest Cost

With a **Progress Universal Spraying Machine.** One man can apply whitewash, calcimine or cold water paint to 1,000 square feet of factory wall in ten hours, and do better work than with a brush. It is also adapted for spreading disinfectants, destroying insect pests and diseases on trees, vegetables and other plants, extinguishing fires, etc. This machine costs only **$16.50** and lasts a lifetime. It pays for itself the first year. Write for detailed description.

Dayton Supply Co., Dayton, Ohio.

CLASS PINS

From our factory direct to you. We sell Class Pins and Badges for Colleges, Schools and Societies; also Society Emblems and Jewels in Sterling Silver and Gold. Send for free catalogue of brand new designs.

C. K. GROUSE & CO.
Dept. 390A, Rochester, N. Y.

ELECTRIC LAUNCH MOTOR. — THE design in this paper is for a motor of unusual simplicity of construction, which can easily be built by an amateur at small cost. It is intended for a boat of about 24 feet over all and 4 feet 6 inches beam, drawing 18 inches, and is capable of propelling such craft at a speed of 7 miles per hour. Illustrated with 21 cuts. See SCIENTIFIC AMERICAN SUPPLEMENT, No. **1202.** Price 10 cents by mail, from this office and from all newsdealers.

This Beautiful Shield Pin is made of a solid piece of silver-white metal, roman gold plated. Silver-white metal inside and gold outside, two precious metals, and was originally made by us to sell for 50c. each but we have decided to use it as a Leader to advertise our other goods. We will send you this pin with any two or three letters desired engraved on it by hand upon receipt of **12c.** in postage stamps which is one-quarter of their real value. The engraving alone would cost at least 50c. at any jeweler's. In order to make this liberal offer we are obliged to dispose of a great many of them, and to do so we ask you as a special favor to show the pin when you receive it to all your friends and induce them to send for one. Write very plainly.
Defiance Jewelry Co., 65 W. Broadway, New York

Instructive Scientific Papers

ON TIMELY TOPICS

Price 10 Cents each by mail

ARTIFICIAL STONE. By L. P. Ford. A paper of immense practical value to the architect and builder. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

THE SHRINKAGE AND WARPING OF TIMBER. By Harold Busbridge. An excellent presentation of modern views; fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

CONSTRUCTION OF AN INDICATING OR RECORDING TIN PLATE ANEROID BAROMETER. By N. Monroe Hopkins. Fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

DIRECT-VISION SPECTROSCOPES. By T. H. Blakesley, M.A. An admirably written, instructive and copiously illustrated article. SCIENTIFIC AMERICAN SUPPLEMENT No. **1493.**

HOME MADE DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **161** and **600** contain excellent articles with full drawings.

PLATING DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **720** and **793** describe their construction so clearly that any amateur can make them.

DYNAMO AND MOTOR COMBINED. Fully described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENTS **844** and **865.** The machines can be run either as dynamos or motors.

ELECTRICAL MOTORS. Their Construction at Home. SCIENTIFIC AMERICAN SUPPLEMENTS **759, 761, 767, 641.**

Price 10 Cents each, by mail

Order through your newsdealer or from

MUNN & COMPANY
361 Broadway New York

Canned fruit and vegetables, R. S. Beston.. 47,316
Canned fruits and canned vegetables, G. H. Eveland 47,324
Canned meats, Francis H. Leggett & Co.... 47,224
Canned vegetables and fruits, Francis H. Leggett & Co. 47,328
Capsules, filled gelatin, J. R. Planten.47,237, 47,238
Carpets and rugs, woven, Bigelow Carpet Co. .....47,210 to 47,212
Carpets, ingrain, Bigelow Carpet Co..... 47,317
Cartridges, paper shell, Winchester Repeating Arms Co. 47,351
Cheese, Francis H. Leggett & Co..... 47,181
Cheese, David Muir & White 47,294
Cheese, Francis H. Leggett & Co..... 47,308
Chemical compound, Preservaline Manufacturing Co. 47,251, 47,289
Chili sauce, tabasco sauce, and salad dressing, Joseph Campbell Co. 47,275
Chocolates, soft center cream, Weinreich-Schneider Co. 47,382
Cigarettes, H. P. Strause 47,285
Clocks, Bowler & Burdick Co..... 47,311
Coffee, Edwin J. Gillies & Co..... 47,149
Coffee, Enterprise Coffee Company of Baltimore City 47,167
Coffee, Merchants Coffee Company of New Orleans, Ltd. 47,306
Coffee, Hulman & Co. 47,307
Cotton flannel, Methuen Co..... 47,368
Cotton piece goods, Tremont & Suffolk Mills, 47,256, 47,350
Crackers, cakes, cookies, and biscuits, Colonial Biscuit Co. 47,165
Damask, J. N. Richardson Sons & Owden, Ltd. 47,362
Detergent for use in washing clothes, C. C. Day 47,321
Dishes, fancy Japanese, B. Matsuki..... 47,231
Door checks and closers, Yale & Towne Manufacturing Co. 47,254
Drillings and sheetings, cotton, D. E. Converse Co. 47,378
Eggs, G. B. Bond 47,139, 47,175, 47,176
Elastic stockings, Pomeroy Co. 47,297
Electrical wiring, junction boxes for, J. L. Gleason 47,361
Embroidery silk, sewing silk, and floss, Incorporated New London Wash Silk Co... 47,332
Extracts, flavoring, Crescent Manufacturing Co. 47,141, 47,142
Fasteners for the waistbands of trousers, Catch On Clasp Manufacturing Co..... 47,355
Files and rasps, Nicholson File Co., 47,233, 47,234, 47,279
Fish hooks in the shape of minnows, C. Kausch 47,363
Fish, salt, Slade Gorton & Co..... 47,164
Flat-bed presses, web perfecting, Duplex Printing Press Co. 47,179
Floor dressing, Simon S. Selig, Jr. 47,339
Flour made from wheat, Pillsbury-Washburn Flour Mills, Ltd. 47,236
Flour, wheat, Acme Milling Co. 47,174
Flour, wheat, Sam. W. Weidler Co..... 47,190
Flour, wheat, Northwestern Consolidated Milling Co. .....47,191 to 47,207
Flour, wheat, Thornton & Chester Milling Co. 47,208
Flour, wheat, Garland Milling Co. 47,329
Fruit preparations, Crown Cordial and Extract Co. 47,144
Fruit preparations and extracts, Crown Cordial and Extract Co. 47,300
Fruits and vegetables and fruit and vegetable preserves and jellies in tins or glass, Wm. Numsen & Sons, Inc..... 47,384
Gin, Bluthenthal & Heilbronner..... 47,303
Gloves, Wertheimer & Co., 47,257 to 47,260, 47,405 to 47,408
Grape juice, Siegel, Cooper & Co..... 47,299
Hats, straw, C. Schmitz & Co..... 47,283
Hooks and eyes, De Long Hook and Eye Co.. 47,393
Horse blankets, Wm. B. Riley & Co.. 47,371 to 47,373
Hose, fabric, American Multiple Fabric Co.. 47,134
Ink ribbons and carbon papers, Crescent Typewriter Supply Co. 47,143
Insecticides, liquid, Omnia Chemical Co..... 47,235
Insulating compound, rubber, Okonite Company, Ltd. 47,349
Jewelry, certain named, Hamilton & Hamilton, Jr. 47,388
Laces, shoe, L. E. Goldstein..... 47,310
Laces, shoe, Fletcher Manufacturing Co..... 47,326
Lard, tallow, lard compounds, and substitutes for lard, Cudahy Brothers Co..... 47,217
Laxatives, Chester Kent & Co..... 47,267
Leggings, leather, Chanavas & Slazenger, Inc. 47,140
Lime, Glencoe Lime and Cement Co..... 47,271
Liniment, S. Dempster 47,268
Linings of insulating material, Keystone Hair Insulator Co. 47,364
Machine knives or cutters employed in fur cutting machinery, Loring Coes & Co., Inc. 47,186
Marine engines, Gas Engine and Power Co. and Charles L. Seabury & Co., Consolidated 47,360
Matches, parlor, Harry Unna Co..... 47,288
Matches, friction, Union Match Co..47,399 to 47,404
Meat, mince, Joseph Campbell Co..... 47,155
Medicinal compound for restoring hair and curing dandruff, August Lohmann & Son. 47,312
Medicine, certain named, Geer Drug Co..... 47,344
Medicine for the cure of headaches, liquid, Rothinghouse Bros. 47,281
Medicine in liquid form for internal and external use, L. A. Chadwick..... 47,266
Metal polish, American Metal Polish Co..... 47,314
Newspapers and periodicals, printed, Tobacco Leaf Publishing Co. 47,171
Oil for affections of the skin, Sceleth, Ericsson & Darling 47,284
Oil, olive, Jordan Stabler Co. 47,184
Oil, olive, Alta Vista Wines Co. 47,261
Oils, lubricating, Valvoline Oil Co..... 47,172
Packing, O. Sayen 47,338
Packing, high grade steam, American Steam Packing Co. 47,135
Packing, rubber, Gibbens & Stream..... 47,148
Pencils, styptic, C. C. Maschal..... 47,277
Pens, fountain pens, and penholders, Spencerian Pen Co. 47,396
Pens, penholders, and fountain pens, Spencerian Pen Co. 47,397
Perfumery, Frederick Stearns & Co..... 47,269
Perfumery, toilet waters, extracts, and cologne, D. R. Bradley & Son....47,214, 47,215
Peroxid of magnesium, E. M. Engelman..... 47,323
Photographic paper and films, Societe Anonyme "Luna" 47,340
Pianos, Mason & Hamlin Co..... 47,391
Pie fillings, H. A. Johnson & Co..... 47,273
Pincers and pincer hammers, F. W. Whitcher 47,209
Popcorn, Albert Dickinson Co., 47,313, 47,341 to 47,343
Poultice, clay, Columbia Chemical Co..... 47,286
Powder, worm, M. W. Savage..... 47,239
Powders, condition, J. C. Zurfluh..... 47,292
Preparation used as a diuretic and uric acid solvent, H. K. Mulford Co..... 47,274
Preparations for the cure of coughs, colds, sore throat, headache, stomach and liver complaints, A. S. Barnes, Jr..... 47,262
Printing films, B. Day 47,145
Razors, Adolph Kastor & Bros..... 47,230
Razors, A. Witte 47,291
Remedies for coughs, colds, lung and bronchial affections, Pineule Medicine Co.... 47,280
Remedies, kidney, liver, and blood, F. D. Van Amburgh 47,290
Remedies, rheumatism, M. R. Blumberg.... 47,213
Remedy for diseases and irregularities peculiar to women, Finlay, Dicks & Co., Ltd. 47,270
Remedy for swine and fowl diseases, W. J. Gorden 47,272
Rings, sealing or fruit jar, Alden Rubber Co. 47,241
Roofing, ready tar and felt, Barrett Manufacturing Co. 47,263
Saws, E. C. Atkins & Co., 47,180, 47,219 to 47,222, 47,386, 47,387
Saws, butchers', F. W. Clemson..... 47,318
Screw wrenches, adjustable, Coes Wrench Co. 47,177, 47,178
Sheetings and drillings, bleached, brown, and colored cotton, J. L. Slater..... 47,337
Shirts and dress shirts, outer, Cluett, Peabody & Co. 47,357
Shoes, leather, Linder Shoe Co..... 47,348
Shot shells and cartridges, Winchester Repeating Arms Co. 47,352

Fire Protection

This illustrates a section of a factory building at Gloversville, N Y., equipped with the

Covert Fire Escape

No other Fire Escape will give the same facilities for quickly vacating a burning building.

It is the simplest and most economical permanent Fire Escape now on the market.

Send for circulars and full particulars.

COVERT FIRE ESCAPE CO.,
Troy, N. Y.

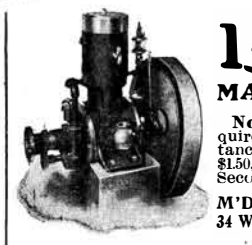
You need this knife on your automobile, in the shop and in your home.

A Veritable Pocket Tool Chest
9 TOOLS IN 1
The Wonder of the Age

Built as substantially as a locomotive. Weighs no more than an ordinary three blade pocket knife. Stag horn handle. In addition to the blade, which is made from 85 carbon cutler's steel, contains the following tools:

1, Leather Punch	5, Alligator Wrench
2, Swedging Awl	6, Hoof Hook
3, Wire Cutter	7, Screw Driver
4, Wire Pliers	8, Screw Bit

Cuts barbed fence wire as easily as an ordinary 8-inch plier. Hoof hook is of great value as a packing hook around the engine. The tools are needed almost every day, and in tinkering around your home the knife will be an invaluable pocket companion. **AGENTS WANTED**
Remit $1.25 for sample to-day. Your money back if not satisfied.
This Knife for an Inventor or in a Model Shop is a Genuine Luxury
DEVINE SPECIALTY CO.
88 Baldwin Building INDIANAPOLIS, IND.
REFERENCE: Columbia National Bank.



15 Days' Trial on This MARINE ENGINE

No Cash Payment required. We pay Freight distance 1000 miles. Spark plugs $1.50, guaranteed 365 days; also Second-hand Engines.

M'DONALD & ERICKSON
34 W. Randolph St., Chicago.

MY BOOK FREE

"How to Remember"
Free to Readers of this Publication.

Stop Forgetting

THE KEY TO SUCCESS

You can stop forgetting by a little practice and a few simple rules. You can study my course anywhere, any time, in spare moments. **You are no greater intellectually than your memory.** Simple, inexpensive. Increases business capacity, social standing by giving an alert, ready memory for names, faces, business details, study. Develops will, concentration, conversation, public speaking, writing, etc. Write today for free copy of my interesting booklet, "How to Remember." Address
Dickson School of Memory, 700 Kimball Hall, Chicago

Clean House With Air

Over 55 Companies operating Thurman Patents in America, and as many more in **Canada, England,** and **Europe.**

FREE CATALOGUE

General Compressed Air House Cleaning Co.
ST. LOUIS, U. S. A.
Manufacturers of the Celebrated Thurman direct-connected Gasolene Driven Air Compressors for Mines, Pneumatic Tools, Etc.

JUST PUBLISHED

The Scientific American Boy

By A. RUSSELL BOND

12mo. 320 Pages. 340 Illustrations. Price, $2.00 Postpaid

THIS is a story of outdoor boy life, suggesting a large number of diversions which, aside from affording entertainment, will stimulate in boys the creative spirit. In each instance complete practical instructions are given for building the various articles.

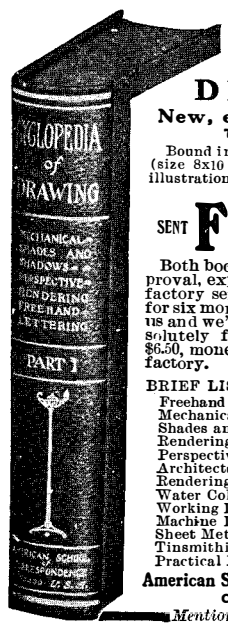
¶ The needs of the boy camper are supplied by the directions for making tramping outfits, sleeping bags and tents; also such other shelters as tree houses, straw huts, log cabins and caves.

¶ The winter diversions include instructions for making six kinds of skate sails and eight kinds of snow shoes and skis, besides ice boats, scooters, sledges, toboggans and a peculiar Swedish contrivance called a "rennwolf."

¶ Among the more instructive subjects covered are surveying, wigwagging, heliographing and bridge building, in which six different kinds of bridges, including a simple cantilever bridge, are described.

¶ In addition to these, the book contains a large number of miscellaneous devices, such as scows, canoes, land yachts, windmills, water wheels and the like. A complete table of contents sent on request.

MUNN & COMPANY
361 Broadway PUBLISHERS OF "SCIENTIFIC AMERICAN" New York City



Cyclopedia of DRAWING

New, enlarged edition,
TWO VOLUMES

Bound in Half Leather, 1200 pages, (size 8x10 ins.) fully indexed; 1500 illustrations, plates, engravings, etc.

SENT FREE FOR EXAMINATION

Both books sent on five days approval, express prepaid. If satisfactory send $1 and $1 per month for six months. Otherwise, notify us and we'll transfer the books absolutely free. Cash with order $6.50, money refunded if not satisfactory.

BRIEF LIST OF SUBJECTS

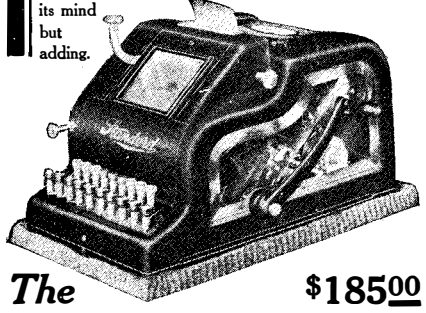
Freehand Drawing
Mechanical Drawing
Shades and Shadows
Rendering in Pen and Ink
Perspective Drawing
Architectural Drawing
Rendering in Wash and Color
Water Color Hints for Draftsmen
Working Drawings
Machine Design
Sheet Metal Pattern Drafting
Tinsmithing
Practical Problems in Mensuration

American School of Correspondence
CHICAGO, ILL.

Mention Scientific American

This Clerk Makes No Mistakes

because it has **infallibly accurate** steel brains.—nothing on its mind but adding.



The STANDARD Adding Machine **$185.00**

does away with the tiresome, time-consuming, mental drudgery of listing and adding. **It can't** make a mistake, and does the work quicker and cheaper than the cleverest accountant could do it.

How cheap? Your time is worth, say, $2.00 an hour. An hour a day running over accounts would be $2.00. Your accountants cost you together, say $10.00 a day. And 25% of their time spent in adding and verifying would be $2.50. That's $4.50 a day.

Now, the Standard costs $185.00—lasts **at least** 12 years. That's $15.00 a year—5 cents a day—to do work now costing you $4.50 a day. But just try a Standard in your own office at our risk and see how quickly it pays for itself, and how much it **earns** thereafter.

Compare The Standard with old-style Adding Machines that print. You will find:

¼ the Keys	All the efficiency
½ the Parts	Much greater Speed
½ the Weight	10 times the Adding Capacity

At less than **Half the Price**—$185.00.

The **Simple Keyboard** makes all this possible. Only 19 keys instead of the mistake-breeding row after row on old-time machines.

The Standard Must Sell Itself

Now just try the machine—that's all we ask, and there's not the slightest obligation to buy. If the machine will pay for itself and earn steady profits for you afterward, you'll take it, won't you? Well, just put the machine in operation in your own office and figure it out on its performance. **Then** say "I'll buy" or "Don't want it"—whichever **economy** dictates. This coupon for your convenience.

The Standard Adding Machine Co.
402 Spring Ave., St. Louis, Mo.

This coupon for the signature of employers or employees
☐—I would like to PROVE the Standard Adding Machine at your risk. Please deliver one for FREE TRIAL. (402)
☐—Please send your booklet, "The Standard Way."
Name
Business
Address State

60 YEARS' EXPERIENCE

PATENTS

TRADE MARKS
DESIGNS
COPYRIGHTS &C.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. **HANDBOOK** on Patents sent free. Oldest agency for securing patents.

Patents taken through Munn & Co. receive *special notice*, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.

MUNN & Co. 361 Broadway, **New York**
Branch Office, 625 F St., Washington, D. C.

Shovels, scoops, and spades, Patterson, Gottfried & Hunter, Ltd.	47,295
Soap, erasive tar, J. G. Haas Soap Co.	47,389
Soap powder, J. G. Haas Soap Co.	47,227
Soldering salt, A. R. Benson	47,264
Soups, Joseph Campbell Co.	47,153
Starch, laundry, New York Glucose Co.	47,309
Stays, Spirella Co.	47,170
Steam and hot water boilers for heating apparatus, Gurney Heater Manufacturing Co.	47,330
Stoves, ranges, furnaces, and heaters, Weir Stove Co.	47,409
Superphosphate of lime, bone dust, bone fertilizer, and tobacco grower, Michigan Carbon Works	47,232
Surgical dressings, Douglas Manufacturing Co.	47,166
Syrups, extracts, and flavorings for carbonated beverages, Standard Bottling Co.	47,187
Tabasco catchup and tomato catchup, Joseph Campbell Co.	47,276
Table and stand covers and towels, napkins, and doilies, Richardson, Roberts Dry Goods Co.	47,336
Tablets for general debility and weakness, Nero Drug Co.	47,278
Tacks, nails, and brads, Shelton Co.	47,240
Tea, uncolored Japan, E. B. Millar & Co.	47,146
Tobacco, smoking, J. Bugg Tobacco Co.	47,293
Turbine wheels, Holyoke Machine Co.	47,331
Undershirts and drawers, Contoocook Mills Co.	47,319
Valves and parts of valves, A. B. Jenkins.	47,333
Valves and parts of valves and cocks and parts of cocks, A. B. Jenkins	47,390
Velvet, N. Erlanger, Blumgart & Co.	47,160
Velvets and velveteens, Wm. Openhym & Sons	47,369
Washboards, American Washboard Co., 47,249, 47,296, 47,301,	47,377
Watch movements, Hampden Watch Co.	47,394
Watches and watch parts, Hampden Watch Co.	47,395
Watchcases, Dueber Watch Case Manufacturing Co.	47,287
Whisky, A. Baetzhold	47,137
Whisky, Berman & Zadek	47,138
Whisky, C. H. Graves & Sons. 47,150,	47,151
Whisky, M. Isenberg	47,152
Whisky, Loeb, Bloom & Co. 47,156 to	47,158
Whisky, National Distilling Co.	47,162
Whisky, Schuster Co.	47,169
Whisky, W. W. Vilsack	47,173
Whisky, C. P. Moorman & Co., Inc.	47,216
Whisky, John Bardenheier Wine and Liquor Co.	47,228
Whisky, F. Jones	47,229
Whisky, Union Distilling Co.	47,252
Whisky, Weideman Co.	47,253
Whisky, Thompson Distilling Co.	47,255
Whisky, Goodman Bros. 47,298,	47,302
Whisky, T. Bush	47,304
Whisky, Fern Glen Distilling Co.	47,325
Whisky, National Distilling Co.	47,334
Whisky, A. Baetzhold	47,354
Whisky, Freiberg & Workum	47,359
Whisky, Lamdin, Thompson & Co.	47,366
Whisky, Loeb, Bloom & Co.	47,367
Whisky, Melvale Distillery Co.	47,392
Whisky, Tom Moore Distillery, Inc.	47,398
Wine, Lenk Wine Co.	47,347
Wine, Alta Vista Wines Co.	47,353
Wine, Empire State Wine Co.	47,358
Wine, Schuster Co. 47,380,	47,381
Wine, Werle & Willoh	47,383
Wines, Rheinstrom, Bettman, Johnson & Co.	47,374
Wines, M. Hommel Wine Co.	47,379

LABELS.

"Antiseptine," for antiseptic preparations, D. S. Hager	12,429
"Burdewa," for cigars, Cole Lithographing Co.	12,418
"Busche Blue Flag Whiskey," for whisky, Atlas Wine and Liquor Co.	12,414
"Cherrisette," for soda water, A. D. Lemaire & Sons	12,435
"Colonial Teeth Powder," for tooth powder, F. X. Cook	12,419
"Creso," for biscuit or crackers, Hitchner Biscuit Co.	12,432
"Department of Converted Specialties," for dry goods, H. B. Claflin Co.	12,428
"Dr. Firth's Hair Restorer and Dandruff Cure. A Guaranteed Remedy for All Diseases of the Hair and Scalp," for hair tonic, Dennett Chemical Co.	12,421
"El Rico," for cigars, J. Knecht	12,434
"Eyrine," for eye medicine, D. S. Hager	12,430
"Flor Fina Cigars," for cigars, Central Lithograph Co.	12,416
"French Antiseptic Tablets," for antiseptic tablets, E. H. Smith	12,440
"Gingerine," for headache powders, E. J. Grunska	12,426
"Hill's Renovator Renews Rugs and Cleans Carpets and Clothing," for cleaning preparation, J. Hill	12,431
"Japanese Rapid Quinine Tablets," for quinin tablets, Japamer Pharmacal Co.	12,433
"Kipawa," for cigars, Cole Lithograph Co.	12,417
"Legrand," for cigars, Michigan Lithograph Co.	12,437
"Lingerie Cloth," for silk fabric, Cozzens, Elbers & Prankard	12,420
"Log Cabin Lye Hominy," for hominy, W. Dugdale	12,422
"Magic Washing Fluid," for washing fluid, A. R. Peters	12,438
"Mangold Breakfast Syrup," for syrup, Cargill-Wight Co.	12,415
"Micmac Indian Horse Liniment," for liniment, R. H. Smith	12,441
"Mrs. Gilbert," for cigars, H. Sommer Co.	12,442
"One Pinch," for medicines for catarrh and like affections, Guarantee Cure Co.	12,427
"Paride's Treasury Compound," for medicine, P. Grasso	12,424
"Perfection Hair Whitener," for hair whitener, L. G. Treulich	12,444
"Rubylite," for lubricating oil, Great Western Oil Co.	12,425
"Saporoso," for canned meats, C. Maspero	12,536
"Skirt Facing," for skirt facing, Sutro Bros. Braid Co.	12,443
"White Eagle the Standard of Pure Rye," for whisky, H. E. Ehrman	12,423
"Yea Yea Eagle," for rye whisky, E. Schwartz	12,439

PRINTS.

"Class Pin Colored Page," for class pins, S. L. Folger	1,465
"Du Pont Smokeless," for smokeless powder, E. I. Du Pont Co.	1,464
"Famous Because the Best," for shotguns, Lefever Arms Co.	1,468
"Ford's Menthol Cherries," for cough drops, F. A. Harford	1,466
"The Peacemaker," for whisky, A. Myers	1,469
"The Portsmouth. A Long Single or Double Breasted Sack Suit, Closing with Three Buttons, Having a Deep Lapel and Two Slits in Back of Coat," for clothing, Kuh, Nathan & Fischer Co.	1,467
"The Samuel Winslow Skate Manufacturing Company, Worcester, Mass, U. S. A., The Best Ice and Roller Skates,'" for ice and roller skates, Samuel Winslow Skate Manufacturing Co.	1,471
"The Truth in a Nut Shell," for signs for stores, Binger Co.	1,463
"Vrooman Sink Strainer," for sink strainers, F. H. & E. B. Vrooman	1,470

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

RAILROADING **WANTED FIREMEN AND BRAKEMEN** for all North American Railroads. Experience unnecessary. Firemen $70, become Engineers and earn $150 Brakemen $65, become Conductors and earn $110. **Unequaled opportunity for strong, ambitious YOUNG MEN.** Name position preferred. State age. Address RAILWAY ASSOCIATION, Room 188, 227 Monroe Street, Brooklyn, N. Y.

WANTED

To buy or manufacture under a royalty a patented article. In replying, give full particulars.

Long-Critchfield Corp.
1202 Powers Bldg., Chicago

LET US BE YOUR FACTORY
WRITE FOR ESTIMATE ON ANY ARTICLE YOU WANT MANUFACTURED
STAMPINGS, MODELS, EXPER. WORK
WRITE FOR FREE BOOKLET
THE GLOBE MACHINE & STAMPING CO.
970 Hamilton St., Cleveland, O.

PLUMBING SCHOOLS.
Men and boys wanted to earn $5.00 a day, after two months' instruction. Position guaranteed. COYNE BROS. CO. PLUMBING SCHOOLS, 239 Tenth Avenue, New York. Cincinnati, O., St. Louis, Mo. Free catalog.

ICE MACHINES. Corliss Engines, Brewers' and Bottlers Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery.
E. V. BAILLARD, 24 Frankfort Street, New York.

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & SUTTON, 228-229 South St., New York

Models & Exper. Work, Gears, Dies, Tools, Small Machy., Scient. Insts. M. P. Schell, 506 Mission St., San Francisco.

MODELS & GEARS INVENTIONS PERFECTED UNION MODEL WORKS 193 So. CLARK St. CHICAGO.

LEARN ART OF ENGRAVING. Situations guaranteed. Send for catalogue. JEWELERS' SCHOOL OF ENGRAVING, 42 Madison Street, Chicago.

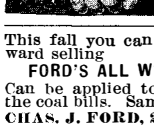
MODELS CHICAGO MODEL WORKS ESTABLISHED 1867 179 E. MADISON ST. CHICAGO, ILL. WRITE FOR CATALOGUE OF MODEL SUPPLIES

MODEL AND EXPERIMENTAL WORK.
Electrical and Mechanical Instruments. Small Mach'y
EDWARD KLEINSCHMIDT. 82 W. Broadway, New York

EXPERIMENTAL WORK Scientifically and accurately executed. Models and small machinery perfected. STENDICKE & VOLKMER, 61 Fulton Street. Telephone 5655 John.

Foot and Power Lathes
Send for catalogue and prices
Carroll-Jamieson Machine Tool Co., Batavia, Ohio

GINSENG The money making crop. Easily grown. Room in your garden to grow hundreds of dollars worth annually. Roots for sale. Plant now. Literature free. Write today.
BUCKINGHAM'S GINSENG GARDEN, Dept. 4, Zanesville, Ohio


We will mail
THIS EXCELSIOR ELECTRIC FLASH LIGHT
for 55 cts.
Battery Capacity 8000 flashes. Intense white light.
Renewal battery 25 cts. Write for 64 page catalog.
ELECTRO IMPORTING CO.,
32 Park Place, NEW YORK.

This fall you can easily make **$5.00** a day and upward selling
FORD'S ALL WOOD AIR-TIGHT WEATHER STRIP
Can be applied to any doors and windows. Reduces the coal bills. Samples and terms FREE.
CHAS. J. FORD, 225 Senior Building, Holyoke, Mass.

LEARN WATCHMAKING
We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Easy terms. Send for catalog.
ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Mo.

Send for this
Print your own cards, circulars &c. Press $5. Small newspaper press $18. Money saver. Print for others, big profits. Typesetting easy, printed rules sent. Write to makers for catalog, presses, type paper, &c. THE PRESS CO., MERIDEN, CONN.

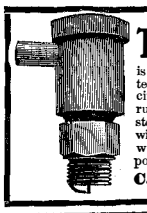
Inspector General of Forests
WESTERN AUSTRALIA

Applications for above position addressed to Public Service Commissioner, Perth, W. A., will be received up to 1st March, 1906. Applicants must have a thorough knowledge of scientific and practical forestry in connection with both hard and soft woods, as well as the administrative ability and experience necessary to undertake the charge of the Forestry Branch of the Lands and Surveys Department.

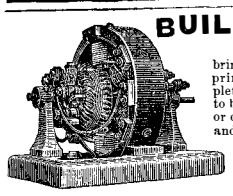
Salary £750. Appointment to be for one year with an undertaking if services prove satisfactory to place the successful applicant permanently under the Public Service Act.

An allowance will be made toward cost of transit to Perth.

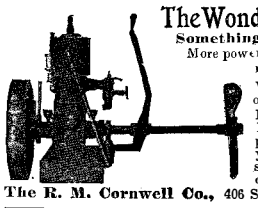
M. E. JULL,
Public Service Commissioner.



The Spark Plug Hat
is a cheap, durable and efficient device for protecting the spark plug from accidental short circuit, by rain or spray. It insures the steady running of your motor in a sea way, where to stop might mean an accident. It does away with starting troubles and skipping from wet wires. For sale by all dealers, or by mail, postage paid, **$1.00.** Fits any plug,
C. H. STUART, Newark, N. Y.



BUILD A DYNAMO
FIFTY CENTS
brings you our book and full size blue print working drawings. Gives complete instructions enabling the amateur to build a 1-10 h. p. rotary converter or dynamo, describes many interesting and instructive experiments. Is invaluable to the student. Changes battery current to single, two or three phase alternating or generates direct and alternating current.
Frost & Sheldon, Elec. Engineers, 47 Hudson Ave., Albany, N. Y.



The Wonder Gasoline Motors
Something New and Up-to-date
More power for less money than any other machine on the market. No valves, gears, etc., to get out of order. Jump Spark. Our 1½ H. P. marine outfit is a "WINNER." Solid or reversing propeller. Our prices will surprise you. Write to-day. Marine or stationary outfits to suit any requirements up to 5 H. P.
The R. M. Cornwell Co., 406 S. Salina St., SYRACUSE, N. Y.

AUTO STORAGE BATTERIES ALL KINDS
THE WILLARD STORAGE BATTERY CO. CLEVELAND, O.

Our Adjustable Draughting Table

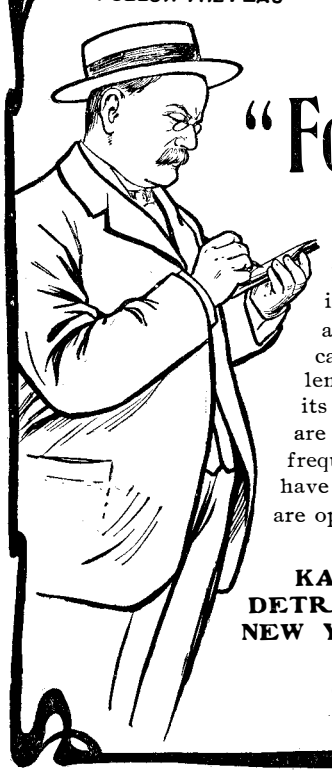
can be tilted to any angle without the operator leaving his seat. We carry them in stock in all sizes We also manufacture Filing Cabinets, Blue Print Frames, etc. Write for Catalogue or ask your jobber.
FRITZ & GOELDEL MFG. CO.
97 Alabama St., Grand Rapids, Mich.

"Economo" Emery Wheel Dresser

Made of an abrasive nearly as hard as a **Black Diamond.** Will true or shape any wheels except very hard and water grinders. Size 12 in. Price **$4.** It costs you nothing to satisfy yourself. Sent to responsible parties on 10 days' approval to compare or test with the Black Diamond. This shows OUR confidence and we want yours.
International Specialty Co.
360 Holden Ave., Detroit, Mich.

"I've figured it out and for many reasons determined to "FOLLOW THE FLAG"

WABASH



"Follow the Flag"

There is nothing more assuring to the traveler than his knowledge of the fact that he is traveling on a firm road-bed upon which is laid the heaviest of steel rails, made true in all their curves, and that the train which carries him is of the highest standard of excellence known in railroads, and is being guided to its destination by experienced minds. These are the conditions which become apparent to the frequent traveler on the Wabash Line, and which have made that line justly famous. Through cars are operated between

ST. LOUIS and CHICAGO,
KANSAS CITY, OMAHA, TOLEDO,
DETROIT, NIAGARA FALLS, BUFFALO,
NEW YORK, BOSTON, ST. PAUL and MINNEAPOLIS

C. S. CRANE, G. P. and T. A.,
ST. LOUIS, MO.

IF YOU SHOOT A RIFLE, *Pistol* or *Shotgun*, you'll make a **Bull's Eye** by sending three 2c. stamps for the *Ideal Hand-book* "*A*," 126 pages **FREE.** The latest Encyclopedia of *Arms, Powders, Shot and Bullets.* Mention SCIENTIFIC AMERICAN. Address IDEAL MFG. CO., 26 U St., NEW HAVEN, CONN., U.S.A.

You Have a Telephone In Your Office, Of Course

Have you one in your home? It will save many steps and much time and annoyance. It will pay for itself in car fare saved. Call No. 9010 Cortlandt, Contract Dept., for full information

New York Telephone Co. 15 Dey Street

New York Belting & Packing Co. Ltd.

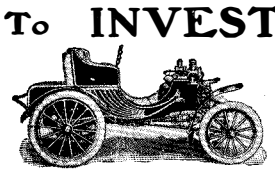
Manufacturers of high grade Rubber Belting, Diaphragms, Dredging Sleeves, Emery Wheels; Air Brake, Steam, Suction and Garden Hose, etc., Mats, Matting, Interlocking Rubber Tiling.

Also manufacturers of moulded and special rubber goods of every description.

Write for catalogue.

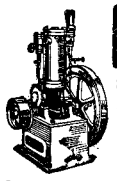
91-93 Chambers St., New York

To INVESTIGATE



The mechanically correct DURYEA, invariably is to purchase. **Duryeas** are different is the reason. Patented features make them for Comfort and Economy Supreme. Send for leaflet it Tells the Reason Why.

DURYEA POWER CO., 44-84 Aeyrud St., Reading, Pa.



CHARTER

Stationaries, Portables, Hoisters, Pumpers, Sawing and Boat Outfits, Combined with Dynamos.

Gasoline, Gas, Kerosene.

Send for Catalogue.

State Power Needs.

CHARTER GAS ENGINE CO., Box 148, STERLING, ILL.

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. Save Money. Lists Free. CHICAGO SCALE CO., Chicago, Ill.

What Is Daus' Tip-Top?

TO PROVE that Daus' "Tip-Top" is the best and simplest device for making **100 copies** from pen-written and **50 copies** from typewritten original, we will ship complete duplicator, cap size, **without deposit,** on **ten (10) days' trial.**

Price $7.50 less trade discount of 33⅓ per cent. or $5 Net

The Felix A. B. Daus Duplicator Co., Daus Bldg., 111 John St., New York

Bausch & Lomb Microscopes

This is an invitation to send for our illustrated catalog of Microscopes if you are interested in best instruments for the least money, those that are used in the leading laboratories everywhere and by individual workers who know the best.

Bausch & Lomb Optical Co.

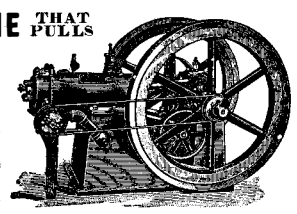
MANUFACTURERS

ROCHESTER, N. Y.

NEW YORK CHICAGO BOSTON

SAN FRANCISCO FRANKFORT A-M GERMANY

THE ENGINE THAT PULLS



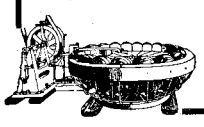
with a strong, steady pull. Used and recommended by thousands. A postal card with your name and address will bring particulars. Our machines and prices will interest you.

Hagan Gas Engine & Mfg. Co.

Winchester, Ky., U.S.A.

West Cold Tire Setter

DOES AN HOUR'S WORK IN A MINUTE



A money making investment for any wheel maker, carriage or wagon builder or repair man. Send for Catalog and our Bulletins.

WEST TIRE SETTER CO. Rochester, N. Y.

GARDNER GRINDER FOR FLAT SURFACES ACCURATE & RAPID FOR UP-TO-DATE SHOPS

CHESLY & Co. CHICAGO ILL. U.S.A.

15 to 21 South Clinton Street.

"Verbum sat sapienti"

There is a pipe with which the tongue cannot possibly be burned and which arrests poison by condensation.

$2.00
10s. 6d
Registered Mail Postpaid

Imported Briar
Sterling Silver
Vulcanite

7 out of 10 Orders from Old Costomers

Inventor and Patentee Direct to Smoker

1904 Model

Improved 1906 model now on the market. No advance in price till after holidays.

Saliva Cannot Possibly Enter Stem

NOT A COMPETITOR WITH CHEAP PIPES

Please Send for Booklet

THE "A-C" PIPE CO., 807 Times Bldg., Broadway & 42d St., New York

Civil Engineering and Surveyors' Instruments

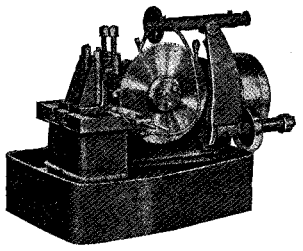
DRAWING INSTRUMENTS, MATERIALS AND SUPPLIES

We are the largest house in the world. Try us on BLUE PRINT PAPER, TRACING CLOTH, DRAWING INKS, or SURVEYING and ENGINEERING INSTRUMENTS

A. S. ALOE CO, 515 Olive Street, - - - St. Louis, Mo.

Write for Catalog. "Sent Free." Correspondence Solicited.

Circular Metal Sawing Machine



Makes a straight smooth cut through a 4-inch steel bar in ten minutes. Will do more and better work than a dozen power hack saws. Grinder attached for sharpening saw.

Ask for circular.

COCHRANE-BLY COMPANY
22 St. James St., Rochester, N. Y.

Pocket Electric Light, $1.00
Electric Pearl Scarf Pin, 2.00
Latest Novelty, Luxury of the Age.
Electric Magic Lantern, 2.00
No danger oil or smoke.
Ivorine Search Light, 2.50
An elegant present for ladies or gentlemen.

Sent prepaid to all parts of United States. Catalogue of novelties sent on application.

UNIVERSAL NOVELTY COMPANY
27 East 21st St., New York

THE Nulite Vapor GAS Lamps

For Home, Store and Street

We also manufacture Table Lamps, Wall Lamps, Chandeliers, Street Lamps, Etc. 100 Candle Power seven hours ONE CENT. No Wicks. No Smoke. No Odor. Absolutely safe. THEY SELL AT SIGHT. Exclusive territory to good agents. ☞ Write for catalogue and prices.

Chicago Solar Light Co. Dept G, Chicago

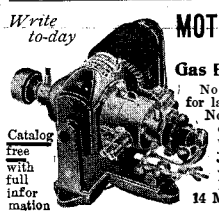
THE STERLING AIR HEATING

RADIATOR

Attached to any **Stove, Range or Furnace. Doubles Heating Capacity or Saves Half Fuel Expense.** Insures continuous circulation, warm floors, comfort and health. Write for full description and terms. Agents wanted. Sells easily, always satisfies.

STERLING AIR RADIATOR CO. No. 58 Wabash Ave., Chicago

Write to-day



MOTSINGER AUTO-SPARKER

starts and runs

Gas Engines without Batteries.

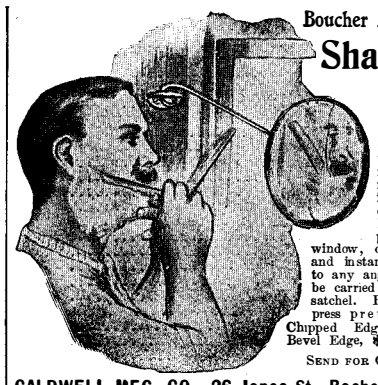
No other machine can do it successfully for lack of original patents owned by us. No twist motion in our drive. No belt or switch necessary. No batteries whatever, for make and break or jump-spark. Water and dust-proof. Fully guaranteed.

MOTSINGER DEVICE MFG. CO. 14 Main Street, Pendleton, Ind., U. S. A.

SPRINGFIELD ABRASIVE POLISHING WHEELS AND BLOCKS.

Used for polishing machinery, cutlery, and edge tools of all kinds and for removing rust spots from highly polished metal. Makes a very smooth surface without marring. Containing rubber which gives it the resilient effect. Made with either Emery or Carborundum in different grades. Write for price list and special trade discounts.

The Springfield Tire and Rubber Co., SPRINGFIELD, OHIO, U. S. A.



Boucher Adjustable

Shaving Glass

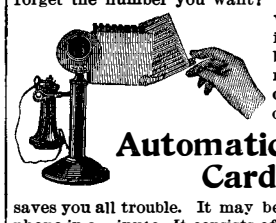
An admirable Christmas gift to a gentleman. It makes shaving safe and comfortable. It may be applied to any window, or elsewhere, and instantly adjusted to any angle. It may be carried safely in a satchel. Furnished, express prepaid, either Chipped Edge, **$1.50;** Bevel Edge, **$2.00.**

SEND FOR CIRCULAR.

CALDWELL MFG. CO., 26 Jones St., Rochester, N. Y.

A BOON TO THE BUSY

How often, when you reach your 'phone, do you forget the number you want? You must either lose valuable time searching through a bulky book or post up your regular correspondents conspicuously where others can see. The



Automatic Telephone Card Index

saves you all trouble. It may be attached to any telephone in a minute. It consists of a handsome aluminum case, holding 170 names of concerns. The cards are alphabetically arranged and can be quickly and easily taken out, When you are through with the one you are using it returns to its place automatically.

PRICE 50 CENTS EACH
SENT POSTPAID

Special low price in lots. This is a most attractive and efficacious advertisement for a house to give to its best customers. We print your name and business on one or both sides as desired, *in quantity orders only.* Whole weight is only 4 ounces. Sure to be in every business office in the country before many months. Write for sample Index, sending 50 cents. Money returned if you are not satisfied.

AUTOMATIC CARD INDEX COMPANY
Dept. A, 327-331 Bleecker St., Utica, N. Y.

Save Time and Money

Progressive business men use

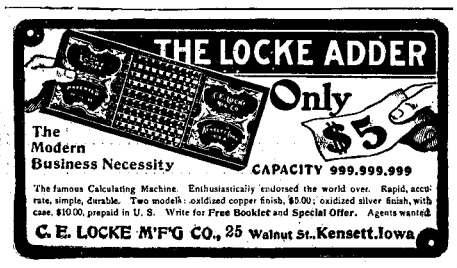
BATES

Hand Numbering Machine

It prints numbers consecutively, duplicates or repeats—changed instantly by turning pointer. To learn how it will save for you, send for Booklet 48 now.

BATES MFG. CO., 31 Union Sq., New York
CHICAGO—304 Wabash Avenue
Factory, Orange, N. J.

THE LOCKE ADDER

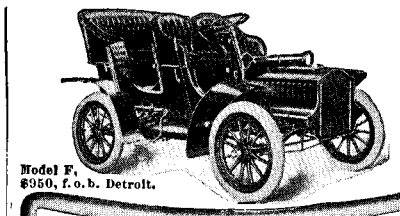


The Modern Business Necessity

CAPACITY 999,999,999

The famous Calculating Machine. Enthusiastically endorsed the world over. Rapid, accurate, simple, durable. Two models: oxidized copper finish, $5.00; oxidized silver finish, with case, $10.00, prepaid in U. S. Write for Free Booklet and Special Offer. Agents wanted.

C. E. LOCKE M'F'G CO., 25 Walnut St. Kensett, Iowa



Model F, $950, f. o. b. Detroit.

A commercial traveler visited 125 towns in 32 days over the rough roads of Minnesota and North Dakota, using no other means of transportation than a

CADILLAC

Isn't this rather interesting proof of Cadillac reliability?

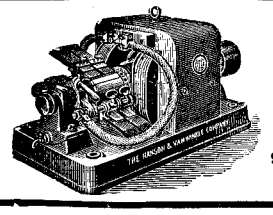
Runabout, $750; Model C, with detachable tonneau, $850; Light Touring car, $950; Four-cylinder car, $2,800; f. o. b. Detroit.

Write for Catalogue N and address of nearest dealer, where you may see and try a Cadillac.

CADILLAC AUTOMOBILE CO., Detroit, Mich.
Member A. L. A. M.

COLD GALVANIZING.

AMERICAN PROCESS. NO ROYALTIES.
SAMPLES AND INFORMATION ON APPLICATION.



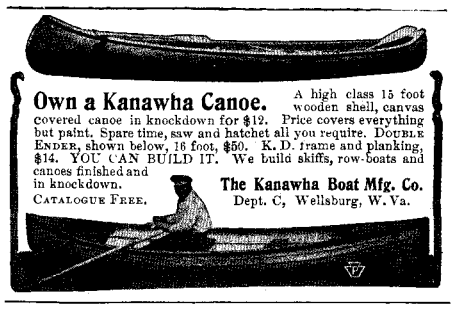
NICKEL AND Electro-Plating Apparatus and Material.

THE **Hanson & VanWinkle Co.,**
Newark, N. J.,
92 William St., N. Y.
30 & 32 S. Canal St. Chicago.

SAVE FIRE LOSS

Seconds count. Be ready at the start with **Badger's Fire Extinguisher** and you can put out any kind of a fire. A request will bring you the information you wish, FREE.

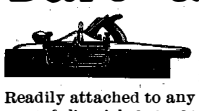
BADGER FIRE EXTINGUISHER CO. 80 Portland St., Boston, Mass.



Own a Kanawha Canoe. A high class 15 foot wooden shell, canvas covered canoe in knockdown for $12. Price covers everything but paint. Spare time, saw and hatchet all you require. DOUBLE ENDER, shown below, 16 foot, $50. K. D. frame and planking, $14. YOU CAN BUILD IT. We build skiffs, row-boats and canoes finished and in knockdown. CATALOGUE FREE.

The Kanawha Boat Mfg. Co. Dept. C, Wellsburg, W. Va.

Sure and True



Honest with its work. Planes bevels of any angle with absolute accuracy.

Shepardson's Iron Plane Gauge

Readily attached to any iron plane. Made of iron and steel, fully nickeled. $1.50, postpaid. *Send for catalogue.*

GOODELL-PRATT COMPANY Greenfield, Mass.

THE OBER LATHES

For Turning Axe, Adze, Pick, Sledge, Hatchet, Hammer, Auger, File, Knife and Chisel Handles, Whiffletrees, Yokes, Spokes, Porch Spindles, Stair Balusters Table and Chair Legs and other irregular work.

☞ *Send for Circular A.*

The Ober Mfg. Co., 10 Bell St., Chagrin Falls, O., U.S.A.

Electrical Engineering

and Experimental Work of Every Description

We have every facility for producing first-class work promptly. Our factory is equipped with modern machinery throughout.

C. F. SPLITDORF
Engineering Dept. 17-27 Vandewater St., N. Y. City

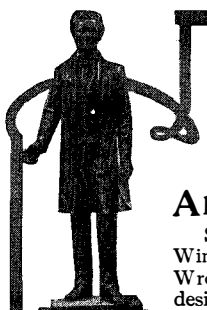
PINEAPPLES

WILL INCREASE YOUR INCOME

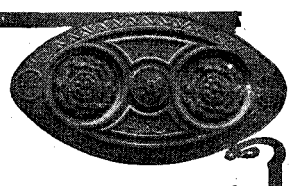
Own a producing Pineapple Plantation in Porto Rico that will pay a steady income for life. Escape the drudgery of the shop, the routine of the office, the ceaseless struggle for mere existence. by putting $10 a month into this highly profitable industry.

One acre will net $350 a year; perpetual profits begin in two years. Deeds given for half-acres and upwards. We plant, manage and market your fruit. Absolute protection for non-residents. No frosts, no tariff, low freights. Strong company; bank references. Send postal, today, for illustrated booklet, "Pineapples for Profit."

LA FORTUNA FRUIT CO. Metropolitan Bldg., New York



Mullins



Makes Everything In

Art Architectural Sheet Metal Work

Statuary—Ornamental Sheet Metal Work—Skylights—Fireproof Windows—Art Metal Tile Roofing—Steel Ceilings—Finials—Wrought Iron Grilles—Cornices, etc., Estimates, models and designs submitted for architects, builders and contractors.

Our 120-Page Catalogue of stock designs will be sent on request.

The W. H. Mullins Co., 203 Franklin Street, Salem, Ohio.

JESSOP STEEL CO.

MFRS OF CRUCIBLE SHEET STEEL
WASHINGTON, PA.